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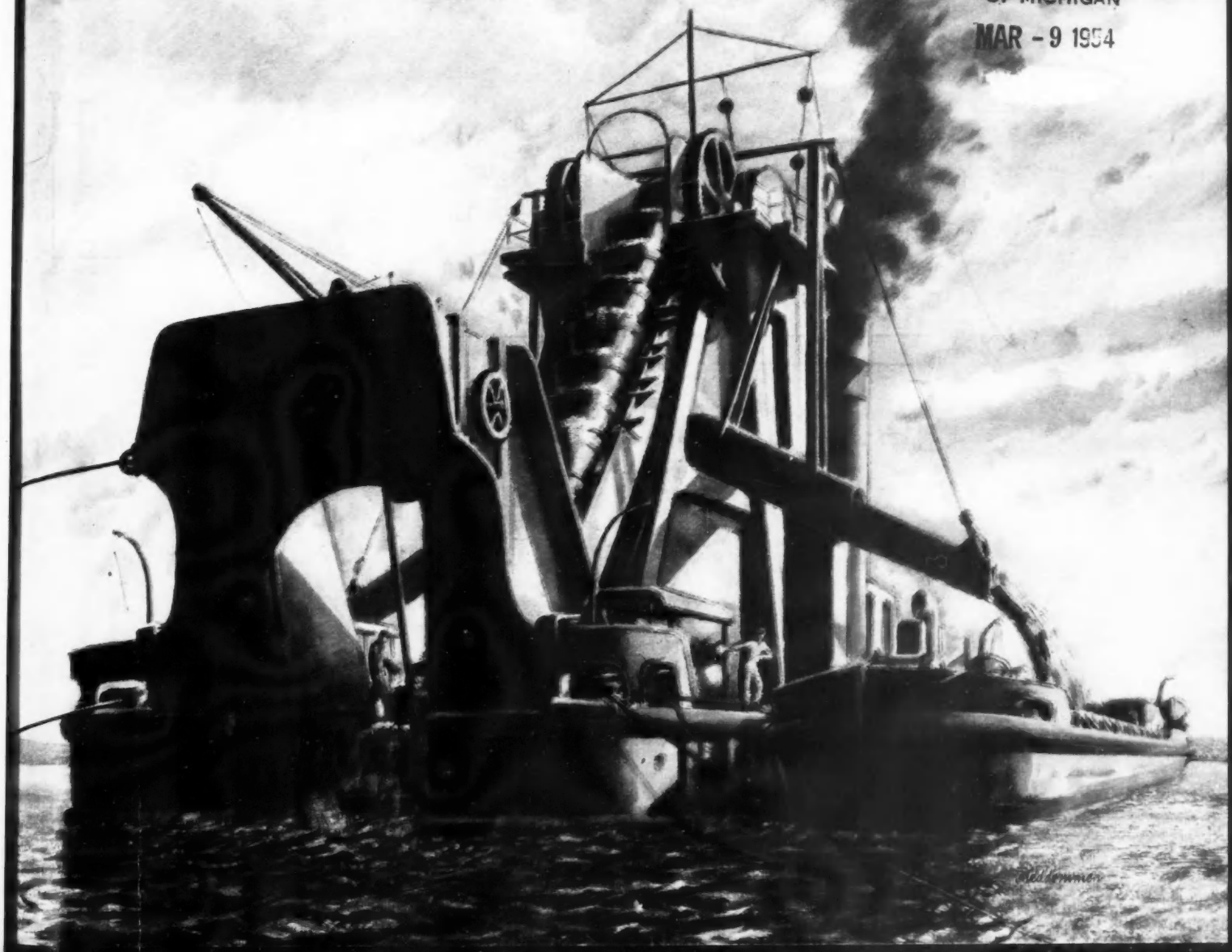

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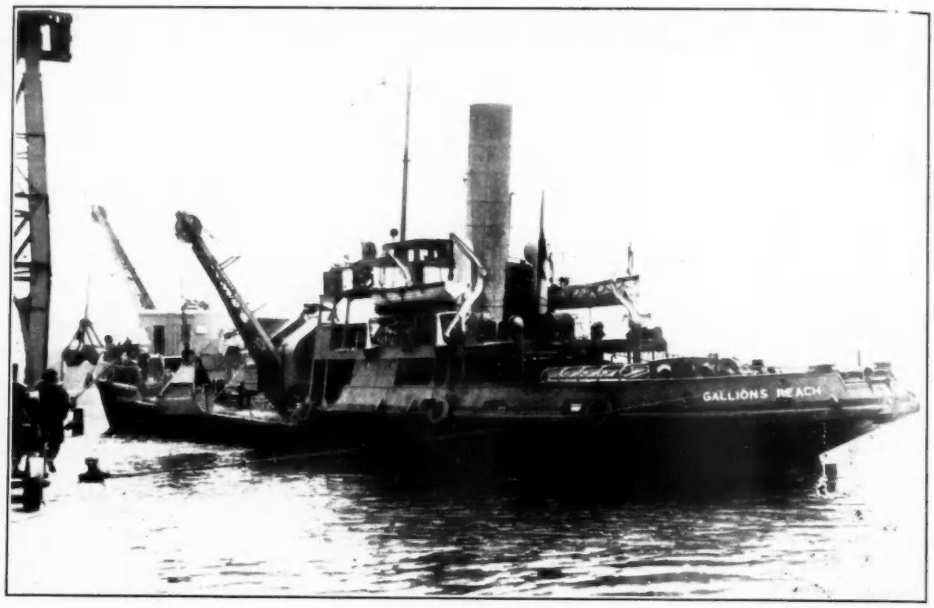

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Editorial Comments

The Port of Algiers.

The seaport city of Algiers, situated on the western Mediterranean, has an excellent harbour and an extensive maritime trade. The old town is of some antiquity, dating back to the early part of the tenth century, and the modern city is built on the broad Bay of Algiers dominated by steep hills more than 600-ft. high. It is the capital of the French dependency of Algeria, which is not regarded as a colony, but is politically a part of the French Republic itself, which is represented by a Governor General.

The original harbour was constructed as far back as 1525, by linking four islands with the shore. Many improvements have been carried out since then, and during recent years, the port has been developed at great expense, as will be seen from the informative article we are privileged to publish this month.

It is interesting to observe that the design of the breakwaters were the result of model tests, and that studies are continuing with a view to further extensions.

In view of the numerous articles upon the subject of port lay-out and cargo handling facilities which have appeared in this Journal during the past year or two, it is worthy of note that in the case of Algiers, the predominance of general cargo in consignments of small size, precludes specialisation and that cranes are considered the most efficient method of handling.

Another item of interest concerns the use of containers. This type of traffic at Algiers, and indeed throughout Europe, is increasing—a trend which may affect the future equipment of ports.

Other points which should be noted include the modern lay-out of the quays with wide aprons which are designed for mechanical handling equipment. Special facilities have also been provided to cater for the large numbers of passengers which visit the port each year. The special plant for the export of wines in bulk is also a unique feature.

The whole article comprises an instructive example of efficient port design and administration, all aspects of port working being adequately catered for.

The St. Lawrence Seaway.

It has been reported from Washington that the Senate has approved a Bill authorising the United States to construct part of the St. Lawrence Seaway in U.S.A. territory, and to co-operate with Canada in controlling the seaway as a whole and in deciding on toll charges. The last time the seaway project was voted upon in the Senate, it was narrowly defeated by three votes.

The Bill must now be approved by the House of Representatives, which hitherto has refused to discuss the matter before affirmative Senate action had been obtained.

The most compelling circumstance which led to the Senate's approval was perhaps Canada's decision to construct the whole of the seaway in Canadian territory if the U.S.A. refused to co-operate. This robbed of any validity opposition arguments that the seaway would harm certain American ports and take traffic away from the railways. These disadvantages, if valid, would still exist even without American participation in the scheme. All that had to be decided by the Senate therefore was whether, on the assumption that the seaway was going to be constructed, the United States was to have any control over it or any say in its management. Again, if Canada assumed the responsibility of constructing the whole of the seaway, she would be able to fix the toll charges and reap all the profits from them, notwithstanding the fact that 70 per cent. of the vessels paying these tolls would be American.

Although the problem of defence had not been mentioned in earlier discussions on the project, this aspect undoubtedly had a great influence upon the more recent deliberations and the voting in the Senate. Supporters of the scheme pointed out that in future wars Canada might be neutral, and even if allied with the United States would, if the seaway were all Canadian, be able to control priority of shipping. The United States Government and the Joint Chiefs of staff strongly recommended therefore that the Seaway Bill should be passed in the interest of national security.

Although its fate in the House of Representatives is still uncertain, strong Government pressure and the arguments which prevailed in persuading a Senate majority to vote in favour of United States participation will, it is expected, prove equally successful there.

Tonnage Measurement.

Any measure which has for its object an alteration of the basis upon which dues are collected, naturally calls for close examination to see if the interests of the two parties—the payers and the collectors—are fairly balanced. Last month a contributor dealt with tonnage measurement rules for ships, largely from the point of view of dock and harbour authorities. In this issue, the new propelling power allowance embodied in the Merchant Shipping Bill now before Parliament is examined primarily from the shipowner's standpoint. The conclusion is reached that the new method of assessment will not necessarily be to the disadvantage of the dues collectors, while benefit in other directions will accrue to the shipowner. Experience alone will show whether this estimate is correct. But there would seem to be soundness in the argument that as shipowners will now prefer to have smaller engine rooms to attract a *proportion* of the 32 per cent., under the " tapering-off " scale, of the allowance instead of aiming at the 32 per cent. they were allowed on artificially large engine rooms, there should be a slight increase of registered tonnage and therefore of liability for dues.

In the second reading debate in the House of Commons, the question was repeatedly asked whether the modification of the propelling power allowance would have any effect on the safety factor of ships. It was stated that safety would be increased rather than diminished, because smaller engine rooms will enable the greater sub-division of the ship into water-tight compartments. A rather surprising view to the contrary was expressed by one of the speakers in the debate, who is also a Lloyd's underwriter. He said that while he did not believe the Bill would increase the safety of ships, he did not think that it would make the risk greater. He asked that naval architects, when designing new ships, should give consideration to the distribution of weight, and he added that the marine insurance world would take the most serious view of the position if, as a result of the Bill, future marine design embodied more danger to the ship. There was also the thought in the minds of a number of speakers that gross tonnage is not the best basis for tonnage measurement, and that the Bill ought to be regarded as the forerunner of a complete revision of tonnage measurement. The suggestion was made that the demands on the port by the ship and the services which the port gave, could better be measured by the displacement of the vessel, its length, its breadth and its draught, than by a " fanciful figure " of net registered tons. As is pointed

Editorial Comments—continued

out in the article in this issue, general revision of the tonnage measurement rules would be such a big undertaking, fraught with the possibility of so much disagreement and dispute, that there is no enthusiasm for the project.

According to one M.P., even the origin of the word " tonnage " is uncertain. He said that this country, in its mercantile law, chose the unit of 100 cubic feet of space of a ship as representing a ton, whereas in the 17th century, the French were measuring their ton by the 42 cubic feet which represented the capacity of the four tuns of the French wine cask. Thus, he submitted, the principle upon which tonnage is measured was wrong for modern shipbuilding practice. It was based on the assumed earning capacity of the ship and was, therefore, a kind of means test on the shipowner in connection with the dues he has to pay to port authorities. He also observed that the legislation on ships' tonnage was " buried in the depths of antiquity," and described it as " probably the most antiquated system of legislation applying to any active industry at the present time and entirely antiquated in the light of modern shipbuilding, engineering and mercantile practice."

Vocational Training for Dock Labour.

On a following page we give an account of a symposium on Training of Dock Labour which was held recently in Rotterdam under the auspices of the International Cargo Handling Co-ordination Association. It was appropriate that Rotterdam should have been chosen as the venue, as this port has led the way in bringing into being a vocational training school for dock labour.

This is a comparatively new innovation in dock operation and is due in the main to the increase in the use of mechanical devices in cargo handling. Two of the papers presented at the conference put forward the views of employers and employees respectively: one by the chairman of an interested firm, and the other by a trade union official. Both were, in principle, in favour of vocational training

In the course of ensuing discussions points were made that when the Port of Antwerp was approached by the International Labour Office on the question of vocational training, they replied that they saw no reason to start such training as they believed that the best way of training dock labour was to place the newcomer in a gang with skilled workers. Another speaker said that so far as he was aware no training was given to longshoremen in any of the ports of the United States. A certain amount of training for some classes of dock labour is given in the Port of Hamburg.

The question of vocational training for dockers would appear to be a matter to which both employers and unions might well direct their attention since cargo handling tends to become increasingly a technical art instead of a matter of bodily strength. Mechanisation has undoubtedly made labour easier and has in the case of Rotterdam, at least, " increased the capacity of the port."

Netherlands Flood Protection Scheme.

Since the disastrous high tides of last year on many coasts bordering the North Sea, flood prevention has received increased attention by the countries concerned. In this connection an interesting scheme is to be put in hand in Holland which no doubt will be perfectly satisfactory for the particular circumstances and size of the undertaking.

The Netherlands State Waterways plan to close up the Hollandse Ijsel river near Rotterdam in execution of first steps recommended by the Delta Commission towards the closing-off of the South Holland and Zeeland estuaries.

This particular project which is estimated to cost 20 million guilder, will mean the construction of two " sliding doors " of a length of 80 metres and a height of 12 metres, to be suspended from towers, not less than 5½ metres above water level, and to be lowered whenever the water is considered to have reached a danger level. In order to prevent interference with the passage of large vessels, it will be necessary to build a lock alongside—to be used also by smaller ships whenever the suspended sliding doors have to be kept closed.

Port Economics.

In our issue for November, 1952, reference was made to the series of articles on Port Economics which were currently appearing in the Journal. We were pleased to be able to report that the series had been highly commended by many of our readers, and also that we had received numerous requests for publication in book form. This has accordingly been arranged, and our printers now inform us that copies of the book will shortly be available.

Mr. A. H. J. Bown, the author of the series, has established a reputation in the field of transport education. His views on all aspects of port affairs carry considerable weight, and his services as a lecturer on the subject are in increasing demand.

Although primarily written for students studying for the Institute of Transport examinations, the articles were welcomed by a far wider range of readers, including teachers, geographers, economists and responsible administrators in the port industry.

The number of copies of this first edition is limited; anyone who wishes to obtain a copy will therefore be well advised to place an early order. The price will be 16s., plus 6d. postage to any part of the world.

Topical Notes

International Conference of Dock Workers.

A conference of dock workers from Belgium, Germany, and the Netherlands was held in Antwerp on January 12th and 13th last under the auspices of the International Transport Workers Federation. The conference was attended by a number of trade union representatives from the ports of Antwerp, Ghent, Amsterdam, Rotterdam, Hamburg, Bremen, and Duisburg.

The chief subjects discussed at the meeting were wages and conditions of work in Belgian, Dutch and German ports, and the problem of the integration of Western European ports. A paper on the latter subject was read by Prof. Van Vlaenderen of the Central Council of Economy. In it he urged the signing of an agreement by the various representatives of the ports of Western Europe similar to the convention adopted by the ports of Marseilles, Genoa and Savona.

The conference concluded its discussions by deciding to call for a tripartite meeting on the subject, to be attended by shipowners and port authorities in addition to the union representatives.

The Antwerp conference was the second of a series to be held by dockers' representatives of Belgium, Germany, and the Netherlands, the first having taken place in Rotterdam in November last. The next meeting will be held on March 23rd and 24th in Hamburg.

Tanker Cleaning Berth on Tyne.

The Tyne Improvement Commission, in conjunction with a number of the major shiprepairing firms on the river, is to provide an oil tanker cleaning berth at North Shields, where tankers arriving for repair can clean dirty tanks and dispose of sludge and residue ashore instead of having to discharge it at sea, with possible pollution consequences.

The scheme is an outcome of the recommendations of the recent Government committee on oil poliution which urged that tanker ports should have reception facilities for the discharge of oily tank washings, oil contaminated ballast water, or other oily residues.

Tenders for the construction of the berth have been invited by the commission, and cover the erection of two concrete dolphins with a strut abutment and service jetty, and access gangways to form one berth for large tankers. The new berth will be along the outside wall of Northumberland Dock, North Shields. It is hoped to complete construction this summer.

Dockers Medical Centre at Bristol.

A new medical centre for dock workers was opened in Bristol last month by the National Dock Labour Board. The new centre, which will be supervised by a fully trained staff, is situated at Canon's Marsh in the centre of the City Docks, and will make it possible for the most modern methods to be available for the treatment of accidents.

For some time the needs of dock workers in the City Docks area have been partially met by a temporary centre. The new building will improve the service. Over 6,000 new cases visit the medical centres at Bristol and Avonmouth each year. Of these about 4,500 are due to accidents at work.

The Port of Algiers

Review of Present Facilities and Trade

By JEAN BAUDELAIRE—Port Director.

SITUATED in a central position on the 1,500 kilometres of Algerian coastline, the port of Algiers has now attained the status of the chief Mediterranean port of French North Africa. It is the starting point of many steamship lines linking Algeria with France and has, in addition, acquired world importance since a number of intercontinental liners began regularly to call at Algiers on account of its excellent situation and commercial importance. In this article we shall first give a survey of the nautical features of the port and of the special technical problems presented by its construction or improvement; we shall then discuss the possibilities that have now been opened up as a result of the latest improvements to the cargo-handling equipment and to the ship repairing and refitting facilities of the port.

I. General layout and external protection of the port.

The port is situated at the western end of the Bay of Algiers, which is wide open to the north for a length of 8 miles between Pointe de l'Amirauté and Cape Matifou. This position provides Algiers with excellent natural protection against the west winds and comparative protection against north and north-west winds. The breakwaters were constructed with a view to improving this protection and to increasing it in order to cope with storms from the north and north-west, which are the severest ones. The most important of these breakwaters are the North breakwater with its extension, the Watier breakwater, and the Butavand and Mustapha breakwaters. For the most part these structures are of the rubble mound type, consisting of a substructure of rock fill covered by a protective casing of precast concrete blocks. The extensive programme of structures of this type which has been carried out in the last 30 years, together with the need for placing artificial blocks of increasingly great weight, have necessitated the use of the "Atlas," a floating crane which is in continual service and is able to handle blocks weighing 500 tons.

Of the works carried out since the end of the war, the most important are the construction of the last 200 metres of the Mustapha breakwater (from 1,100 to 1,300 metres) and of the transverse jetty of this breakwater. These two structures, the construction of which was preceded by tests on models, both have the effect of producing calmer water in the Mustapha basin. The breakwater extension helps to achieve this result by removing the point of rotation of the swell around the tip of the breakwater to a greater distance, while the transverse pier does so by reducing the width of the south entrance of the harbour. The users of the port are unanimously of the opinion that the desired result has been achieved and that the surf which north-east winds tended to produce in this basin has been considerably reduced.

In its present condition the port with its three basins provides 115 hectares of protected water area, with 45 berths, 12 of which can take vessels of over 9 metres draught. This is ample accommodation for the shipping traffic of the port and eliminates practically all risk of vessels having to wait for a berth. In addition, the port lies on a very busy shipping route, so that vessels calling at it need not make any detour. Its approaches are marked by the two lighthouses of Cape Caxine and Cape Matifou, each provided also with a wireless beacon, while the position of the harbour itself is marked by the white flashing light of the Watier breakwater which, in the event of fog, is supplemented by a low-powered wireless beacon sychronised with an acoustic signal. The north and south entrances giving access to the port are wide open to the sea and call for no complicated manœuvres or excessive reductions in speed on the part of vessels passing through them. Even though it is, as in all French ports, compulsory for vessels to be piloted, it is often unnecessary to call in the assistance of tugs, and statistics prove that only a quarter of the number of vessels entering or leaving the port make use of the tug service.

We have thus briefly summarised the situation as it is at present. Plans for future improvements are being drawn up and carefully studied. They, too, aim at achieving calmer water inside the harbour, especially with regard to the basin of the Old Port. The disturbance entering this basin from the north-east due to the swell outside is caused partly by the swell swinging round the tip of the Watier breakwater and partly by the swell reflected back from the Butavand breakwater, both factors contributing about equally to this effect. These two causes of disturbance would be virtually eliminated by the construction of an outer harbour comprising a new east breakwater running roughly north and south and the extension of the Watier breakwater by about 400 metres. This important programme is at present being studied with a view to determining the most suitable positions of the various works to be constructed.

II. A port for general cargo.

As distinct from many ports serving industrial regions, Algiers has remained essentially a port for general cargo. Of the 3,658,409 tons of goods handled by the port in 1952, nearly half, viz. 1,788,403 tons, was general cargo, while the remainder consisted of inward cargoes of petroleum products and coal and of exports of ships' fuel and ore. It should furthermore be noted that, with the exception of exports of wine in bulk (amounting to some 320,000 tons, which justified the installation of special equipment), this general cargo consists of numerous batches of goods, often oddly assorted and awkward to deal with on account of their lack of uniformity. Here lies the chief difficulty with regard to the sort of equipment with which the berths for handling these goods have to be provided. The small size of the individual batches and the extremely great diversity of the types of goods to be handled preclude any kind of specialisation. The majority of the berths must be fitted with standard equipment consisting essentially of sheds and cranes capable of dealing indiscriminately with any sort of cargo.

Mention must be made of a new feature which has arisen in the last few years in connection with cargo-handling in the port: the use of the container. As the greater part of the general cargo forms part of a regular flow of goods in both directions between Algeria and the mother country, this new method of transport found particularly good scope for development: inward cargoes consist of industrial products which are often fragile in character and valuable, while a good deal of the return cargo consists of exports of fruit and vegetables. A considerable tonnage of cargo is already shipped in containers: for 1952 this figure may be put at 21,000 tons. It will probably be possible to develop this means of transport much further, and we are here faced with a new element which may have an effect on the subsequent equipment of the port and which will in future have to be borne in mind.

Besides the 4 berths equipped for the handling of passengers, which will be mentioned in greater detail in due course, there are 18 berths provided with equipment of the type consisting of sheds and cranes for dealing with general cargo. These latter are distributed as follows: 2 on the Biarritz quay, 2 on the Bordeaux quay, 8 on the Morard pier and 6 on the Billiard pier and the Fédalah quay. Ideas as to how these berths should be equipped have in course of time undergone evolution in connection with the development of trade and of cargo-handling plant.

The Billiard pier, which has the most modern equipment, would also appear to be best adapted to present-day conditions, which are characterised by the high percentage of goods (about 50 per cent. in the case of this pier) which do not require storage under cover and by the ease of horizontal movement of cargo thanks to the use of fork-lift trucks and tractors drawing trailers. Preference must therefore be given to wide piers allowing freedom of move-

The Port of Algiers—continued

Billiard Pier—General View.

ment. (In this case: width of pier 160 metres, length of the berths 150 metres.) This presents an important advantage in that the transit sheds need not have more than one storey. This simplification considerably reduces the cost of construction of the sheds (per square metre of building, the cost of a two-storey shed at Algiers is about 5 times as high as that of a simple single-storey one), while the waste of time and the cost entailed by the operation of lifts is eliminated.

In the case of the Morard pier, where there was less space available, the sheds are provided with a second storey which is served by lifts capable of handling lorries. Experience shows that users of the shed tend to use the upper floor only for storing important cargoes which arrive as complete hold- or ship-loads (in particular: sugar, potatoes and grain) ; but these are, on the whole, exceptional at Algiers.

In contrast with what is met with in many other ports, the width of the apron, between the shed and the edge of the quay, is considerable (20 to 30 metres in the case of the newest berths). The area of shed per berth is limited owing to the fact that a high proportion of the cargo does not require storage under cover. On the Billiard pier, this area is 2,160 or 2,700 square metres, depending on the berth concerned. Although it is not the most economical solution, the sheds have in most cases been provided with flat roofs, because these can serve as storage space—if not for regular cargoes, at any rate for objects which would otherwise be in the way or which generally have a prolonged sojourn at the port, especially cargo-handling pallets and empty containers awaiting shipment. In certain cases these flat roofs are provided with hoppers which allow goods to be deposited by crane directly into the shed.

It was a long time before Algiers — or, indeed, any of the Mediterranean ports of North Africa—was equipped with quay cranes. Until the war, the equipment was limited to only one crane per berth. For four years strenuous efforts have been made in this connection by the Chamber of Commerce, with the result that the port was recently provided with 20 new cranes, so that the number of cranes on most of the quays has now been increased to two per berth. This number appears to be sufficient for present requirements, especially if it is taken into account that—as it is exceptional for all the berths of one and the same quay to be occupied at the same time—it is often possible to provide three or four cranes for each vessel loading or discharging cargo. The cranes employed are mounted on portals of 10 metres span which can straddle two railway tracks. The radius in most cases is 17 metres. Until the war, a lifting capacity of 3 tons was considered adequate. The development of the container made it necessary to modify these views and to decide in favour of cranes capable of handling loads of 5 or 6 tons. In certain cases, however, in view of the fact that such loads continued to be of rather exceptional occurrence, it was considered permissible to instal cranes which would lift loads in excess of 3 tons only when operating at a reduced radius. This solution, which effects a compromise between cargo-handling requirements and economy, appears to be quite satisfactory.

In concluding this description of the equipment of the general cargo berths, it should be pointed out that at Algiers the railway lines serving the port are of far less importance than in mo other ports. About 80 per cent. of all goods passing through t e port are conveyed to it or from it by road. In these circumst ces it was deemed sufficient to provide most of the quays with tw tracks along the quay edge which pass beneath the portals of the anes, while two further tracks are provided at the centre line of t e pier for the removal of goods that have passed though the transit sheds.

III. Special equipment.

As has already been said, Algiers is essentially a port for general cargo. In the traffic of this port heavy bulk cargoes are not as predominant as they often are in other ports. In 1952, cargoes of this type comprised:—

Imports: 849,698 tons of petroleum products and 212,501 tons of coal, of which 552,627 and 23,242 tons respectively were re-exported as fuel for ships.

Exports: 231,938 tons of iron ore.

At Algiers, the special equipment for handling these cargoes presents no points of particular interest. When dealing with the fuelling installations for ships, we will merely devote a few words to the equipment for the handling and storing of petroleum products.

On the other hand, there are two particular aspects of the traffic through the port of Algiers which, although they are associated with the traffic in general cargo, call for special mention because of the important, and in some cases original, character of the equipment to which they have given rise, viz. in the first place the passenger facilities, which at Algiers are closely connected with the trade in vegetables, and secondly the plant for handling wines in bulk.

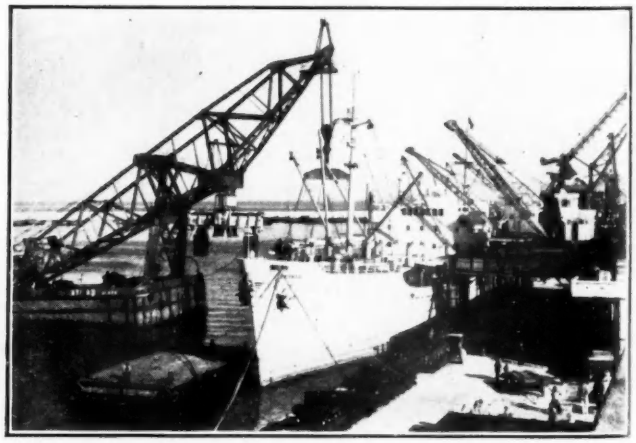
Passenger Facilities of the Port

The conveyance of passengers has always been an important part of the activities of the port of Algiers. It presents the two following aspects:—

On the one hand, Algiers is the starting point of several steamship lines operating between Algeria and France.

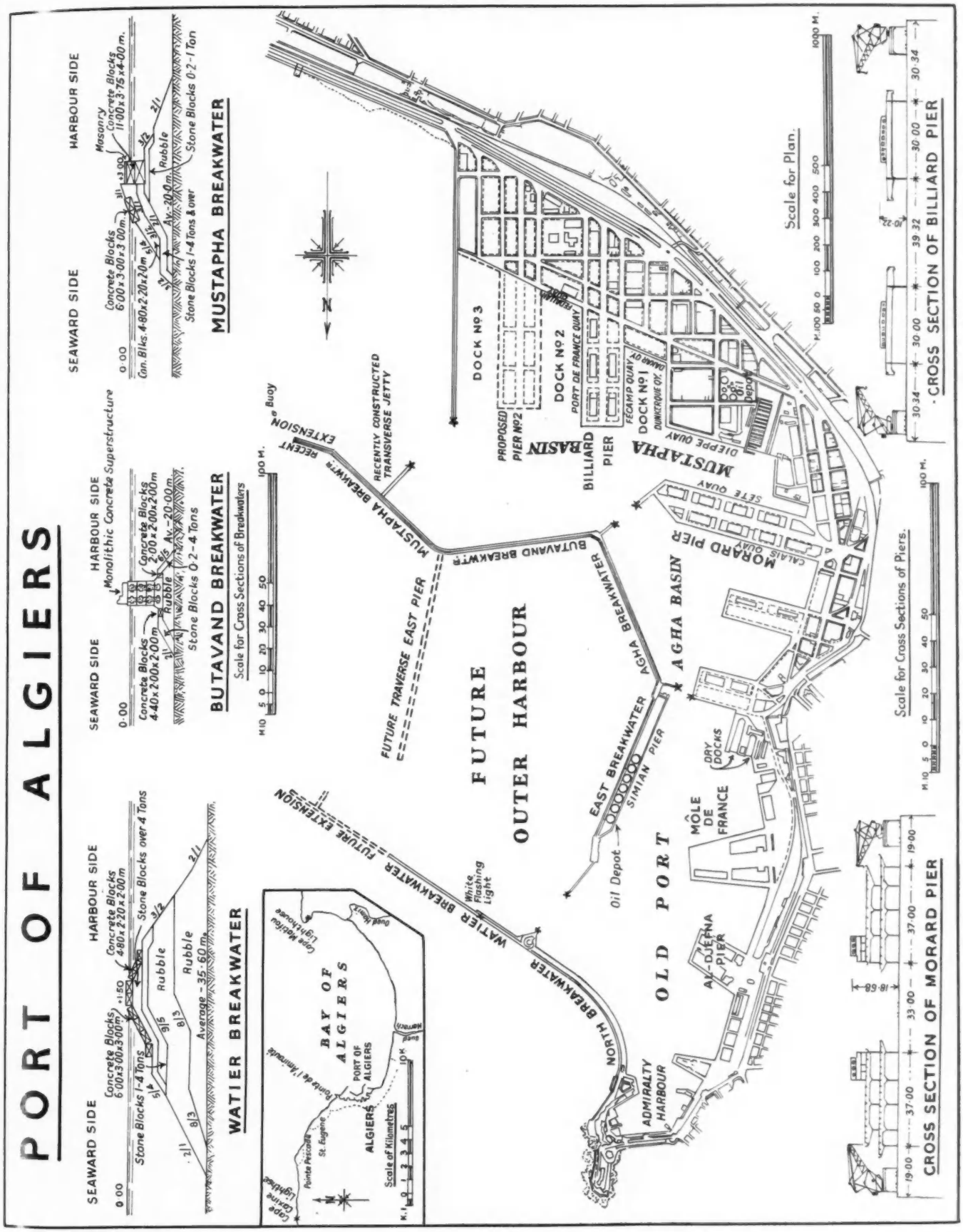
On the other hand, it is a port of call for various international steamship lines and for many steamers on tourist cruises. The number of passengers and tourists of this category passing through the port rose to 81,165 in 1952.

The former of these two categories of passenger traffic is of considerable importance. In spite of increased competition from airlines, the number of passengers travelling by the steamship lines connecting France and Algeria is continually rising. In 1952, it reached the figure of 372,122, as compared with an average of about 250,000 in the years preceding the war. This traffic exhibits a marked seasonal character, the number of passengers during the holiday period (July, August and September) amounting to about 46 per cent. of that for the entire year. This period happens to



Group of cranes at work—Port of Algiers.

The Port of Algiers—continued



The Port of Algiers—continued

coincide with that during which the customary export trade in fruit and vegetables from Algeria—which at present amounts to close on 300,000 tons annually—is almost completely at a standstill. This fortunate coincidence, coupled with the fact that the fast passenger steamer constitutes an excellent means of transport for vegetables, is the reason why the vessels plying between Algeria and France have for many years past been designed for a dual purpose. Fruit and vegetables provide these vessels with very welcome freights during the slack season for the conveyance of passengers. This special state of affairs obviously had to be taken into account in designing the passenger-handling facilities of the port of Algiers.

Until a few months ago, only two berths, one on each side of the Al-Djefna pier, were used for passenger traffic. In view of the expansion of traffic—in passengers as well as in vegetables—these two berths, the equipment of which dates from 1927, were becoming more and more inadequate. Even before the war, the Chamber of Commerce accordingly decided to equip a second pier for passenger traffic. The scheme as a whole would not only have to make provision for passengers, but would also have to include important special installations for the handling and storing of vegetables, especially cold storage. For this purpose the Môle de France, comprising four berths 150 m. in length and suitable for vessels of 10 metres draught, was constructed in the years immediately preceding the war. Work on the first stage of fitting out this pier, viz. the equipment of the two berths at the root or landward end, was begun in 1950. This part of the scheme has now been completed and put into service.

Môle de France—General View and Plan (right).

The scheme as a whole comprises:—

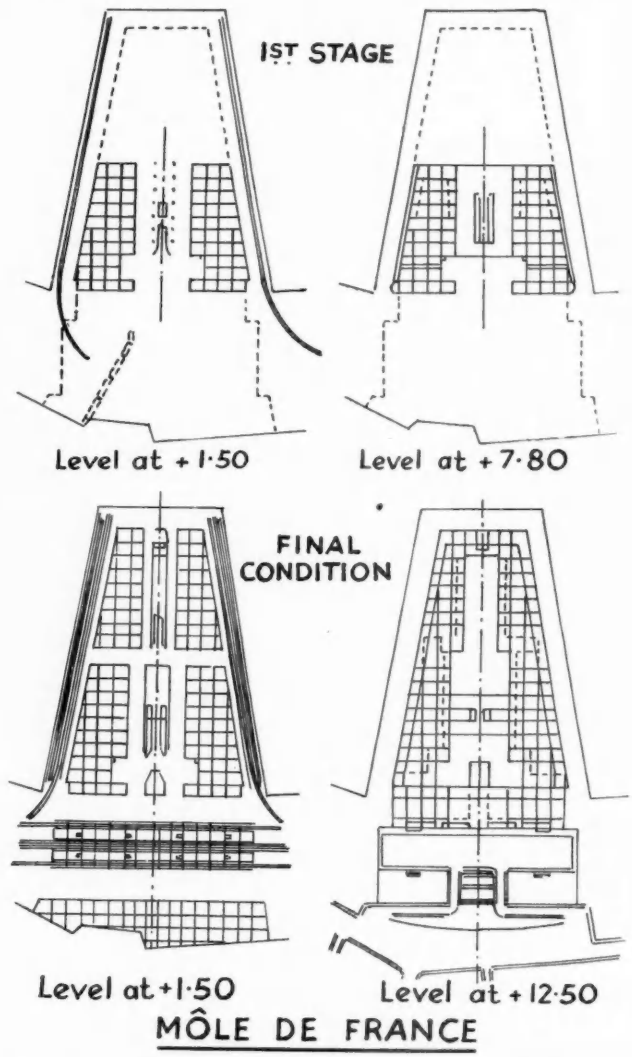
(1) At the root end of the pier: arrangements for receiving fruit and vegetables brought by train, and passenger-handling facilities.

(2) On the pier itself, for each of the four berths: a shed consisting of a ground floor and two upper storeys. The ground floor is intended for the storage of general cargo, the first floor for the shipment of fruit and vegetables, and the second floor for storing them. The two upper storeys are to be equipped wholly or in part with plant for freezing these goods.

The first stage of this scheme, viz. the fitting up of the two berths at the root end of the pier, was recently completed. These two berths are used for passenger traffic. As a provisional arrangement, the sheds have a ground floor where luggage and general cargo are handled and one upper floor for dealing with fruit and vegetables. Access to this upper floor is provided in the form of a central ramp, so that lorries can be unloaded directly on to the great platform constructed at a level of +7.80 between the two berths. The fruit and vegetables are taken and stored at the same level in the sheds until the time of shipment. Part of the available floor space has been set aside for freezing plant. The execution of this part of the programme has, however, been put off for the time being.

As regards passenger traffic, the facilities provided at the root of the pier include a waiting and customs examination hall and steamship companies' offices, etc. Deck passengers are dealt with at ground level, while those of other classes are dealt with on the upper floor. These latter passengers embark at the level of this floor by means of gangways which are placed in position between the ship and the building by cranes. In the final stage of the scheme, a spacious promenade constructed at the level of the flat roof of this building will directly connect the seafront boulevard of the town with the new passengers' building, so that the traveller will then be able to embark straight from the heart of the city.

The stage of construction that has now been reached took three years to complete. Extensive use was made of the latest constructional methods in prestressed concrete and prefabrication



technique. Thanks to these activities, the port of Algiers now has four berths equipped for passenger traffic. This equipment, which is amply justified by the considerable number of passengers using this port, will probably promote further expansion of the tourist traffic in the future and bring about an increase in the number of visits from steamers on Mediterranean cruises.

Special Plant for the Export of Wines in Bulk

The export of wines has always constituted an essential part of

The Port of Algiers – continued

the activities of the port, as will be apparent from the following table:—

YEAR	TONS OF WINE EXPORTED	% OF ENTIRE EXPORTS (incl. fuel for Ships)
average 1936-37-38	610,423 tons	36%
1952	401,031 tons	21.5%

The greater part of the trade—now as well as before the war—is carried on with France or, to be more precise, with a small number of French ports, chief among which are Sète, Rouen and Dunkirk. This concentration of a considerable tonnage of cargo on a limited number of ports of destination has of recent years led to the establishment of special installations—both on land and on the vessels concerned—for the transport of these wines in bulk. This method of transport, which originated in the years immediately preceding the war, now comprises 80 per cent. of the wine exported from Algiers. At first, special vessels were used in which all available space was taken up by tanks ; but the system is evolving more and more in the direction of vessels capable of carrying a mixed cargo, some of the holds being equipped with tanks, while the others are used for general cargo.

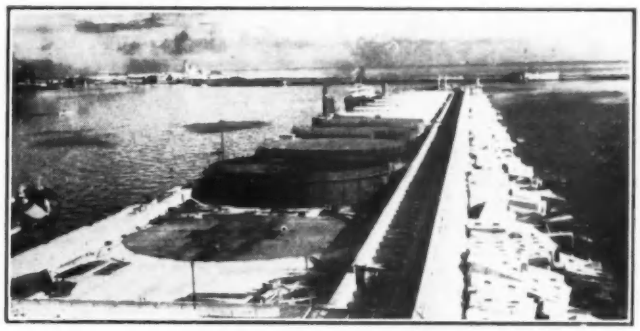
These vessels were, at first, loaded directly from tank lorries which brought the wine to the quayside, from where it was pumped aboard. It was soon found advantageous to store the wine in transit depots where it is received in the course of some days prior to the arrival of the ship. From these depots the wine is quickly pumped aboard by means of pipelines and powerful pumping equipment. In the last few years, numerous depots of this kind, with a total storage capacity of more than 200,000 hectolitres, have been built in the port area. The latest of these is a public depot of 20,000 hectolitres capacity, which was built for the Algiers Chamber of Commerce.

Having regard to the growing tendency to convey wines in bulk in vessels for mixed cargo, which are accordingly governed in their choice of a berth by the general cargo to be loaded and discharged, the Chamber of Commerce recently decided to complete the wine-handling equipment by constructing a system of pipelines serving the various berths of the two principal piers from which the despatch of wines in bulk takes place. This system of pipelines will be at the disposal of the depot of the Chamber of Commerce and of a group of private depots representing upwards of 100,000 hectolitres storage capacity and already interconnected by pipelines. The new equipment, which is at present in course of construction, will have plastic pipes, some of which will be 150 mm. in diameter and discharge 1,000 hectolitres per hour, while others will have a diameter of 120 mm. and a discharge of about 600 hectolitres per hour. In equipment of this kind it is essential to be able to empty the pipes effectively. This is achieved either by using compressed air or by vacuum. The former method enables the whole contents of the pipe to be forced into the ship, whereas by the latter method it is drawn back into the tanks of the depot.

IV. Installation serving the ships :
Algiers as a Port of Call

On account of its geographical position between Gibraltar, Malta and Alexandria, and as it is situated on the India route which is tending to become the great oil route, Algiers has long been predestined to become an important port of call. Thus even as far back as 1913, 4,856 ships called at the port and took aboard a considerable proportion of the 818,010 tons of bunker coal sold during that year. In proportion as the use of oil fuel for ships increased, the port was compelled to convert its fuelling plant and adapt it to this new type of fuel. This process of conversion has now been completed, and the port possesses three important storage areas which are specially equipped for supplying fuel oil to ships.

The new Passenger Terminal.



Oil Depôt on Simian Pier

1. The Venture-Weir depot is located on the Simian pier. Its present capacity is 31,000 cubic metres; 5 additional tanks, now under construction, will increase this to 52,000 cubic metres. This depot has been specially designed for supplying fuel oil either directly to the various berths of the Simian pier, which has a deep-water quay, or to other berths by means of two tank lighters of 900 tons burden. Thanks to the four pumps with which the depot is equipped, two of which can deliver 500 tons an hour each, all pumping operations are performed with maximum speed.

2. The depot of the Société Algérienne des Pétroles Mory, which is located on the Mustapha reclaimed area, comprises 10 reservoirs with a total capacity of 59,600 cubic metres. Pipelines connect it with the various berths of the Billiard pier and with the Dakar and Dunkerque quays. Each pipe can deliver 250 tons per hour. In addition, this company operates two tankers of 800 and 1,500 tons capacity respectively.

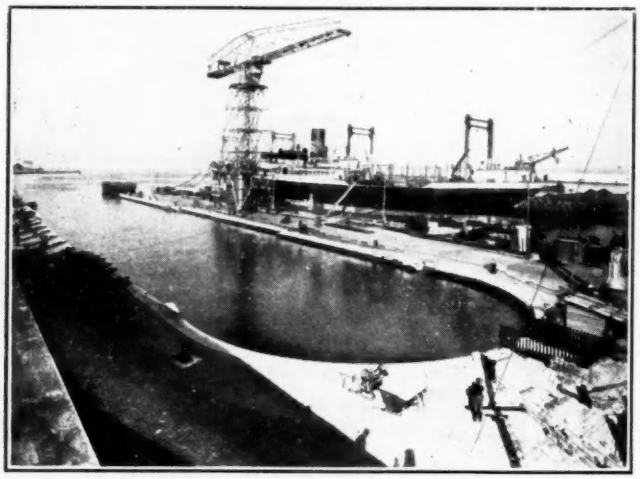
3. Finally, there is the depot of the Société Méditerranéenne de Combustibles, located near the previous one and having a capacity of 39,680 cubic metres. This depot is also served by pipelines connecting it with the Dunkerque and Dieppe quays and enabling oil to be discharged from tankers at the rate of 800 tons per hour. The equipment includes a tank vessel of 1,500 tons.

Thanks to these extensive installations, which are well designed and of recent construction, Algiers has, during the past few years, been able to maintain and even to develop its traffic as a port of call. Thus, in 1952, of the 18,186,989 net tonnage of shipping that entered or left the port, 1,271 vessels—representing 40 per cent. of the total tonnage—used Algiers as a port of call. Of the 575,869 tons of fuel supplied to all vessels (of which only 23,242 tons was coal), about 60 per cent. was taken aboard by vessels of the latter category. These figures will suffice to show the success achieved by Algiers in this sphere, which success is justified by its geographical position, the adaptation of the equipment of the port to the requirements, and the facilities it offers to shipping. In this connection we will content ourselves with mentioning the principal services which enable these various requirements to be met.

The towing service is performed by the Entreprise de Remorquage, de Sauvetage et d'Acconage, which has three tugs of 1,250 800 and 650 h.p. respectively. The first of these, the *Saint-Louis*, is a sea-going tug which is frequently called out on salvage jobs anywhere in the western Mediterranean.

Fresh water is supplied by the Société Charbonac by means of a system of water hydrants installed on the quays and the operation of four tank lighters. This service ensures the rapid supply of water at any hour of the day or night. The moderate charges, which are lower than those of most other Mediterranean ports, have conduced to the development of this service, which supplied 280,000 tons in 1952.

The Port of Algiers—continued



The large Dry Dock and Repair Quay.

Finally, we would mention that the port has two drydocks, 74.30 and 136.40 metres long respectively. The larger of the two, which was recently lengthened at the initiative of the Chamber of Commerce, is now able to accommodate Liberty ships. It may be added that the various workshops with which the port is provided are now equipped for carrying out all types of maintenance and repair work to the hull, engines, electrical installations or navigational equipment of ships.

The port of Algiers thus forms a comprehensive whole which is well adapted to the functions it has to perform. The tiny harbour of not much more than a century ago has developed into a vast expanse of water. Its three basins are provided with all the installations that are nowadays required in a great modern port which has to offer the maximum of facilities to passengers, vessels and cargoes. The constant development of these installations and their adaptation to local conditions are the best guarantee for the increase of the traffic of the port, together with the growing needs of a continually increasing population and an expanding economy.

Ocean Towage and Salvage

Important Part Played by Dutch Tugs

(By a Special Correspondent)

To many people, tugs are just small craft, employed in rivers and canals, towing barges and lighters or assisting ships to their berths in tidal harbours. Besides river and canal tugs, however, there are two other types, the coastal tug and the ocean-going tug. Actually the latter type is the most important of them all. All these branches of towage are carried out by the Dutch, but their special skill in this sphere is particularly reflected in international deep-sea towage.

There is a very close connection between ocean towage and the dredging industry in the Netherlands. Owing to the constitution of the Dutch soil and its many hydraulic and irrigation works, the dredging industry has reached a high degree of perfection earlier than in many other countries. The birthplace of the large Dutch dredging concerns lies along the same river where the first Rotterdam tugs were built, and here the shipyards were founded for making suction dredgers, hoppers, rock breakers and barges. All over the world, where dredging and reclamation operations had to be carried out, the authorities concerned wanted to make use of Dutch experience, and consequently the problem of towing dredging plant over the oceans arose much earlier in the Netherlands than anywhere else.

Besides two Dutch deep-sea towage companies there are some other towage firms, however, which do not specialise in deep-sea towage, but are principally engaged in the salvage of vessels along the Dutch coast. The larger of the two deep-sea towage companies was established as early as 1842. Its first unit was an old-fashioned paddle tug, built in 1842 with a steam engine of 200 h.p., mainly used for the towage of sailing vessels in the Rotterdam approaches. The increasing demand for towage to remote destinations resulted in the construction of special ocean-going tugs, and the first real ocean tugs were commissioned in 1892.

Towage was no longer limited to dredging plant. All kinds of objects from floating drydocks and large ocean liners to small coastal and river vessels, from large tin dredgers to the smallest canal dredgers, have been towed safely to their destinations all over the world. Moreover the organisation established along the Dutch coast to render assistance to ships stranded or in distress, has been developed to a high degree of perfection.

During the winter months from 1922-23 onwards, tugs were also stationed at selected points round the rim of the Atlantic, so as to be able to cover the principal shipping routes and render first aid wherever required.

A new phase in the development of ocean rescue and towage was introduced when the first large motor salvage tug was put into commission in 1933. This tug, the "Zwarte Zee," which was then the most powerful tug in existence, came up to expectations and this determined the future policy of the tug's owners to adopt the oil engine for tug propulsion. New motor tugs of various sizes joined their fleet at regular intervals right up to the Second World War.

When hostilities broke out, most of the vessels of the Dutch towing fleet were able to escape to England, whilst those units which were at sea or stationed at foreign ports, joined the Allied cause. Many important commissions were entrusted to and carried out by the Netherlands tugs. Dutch tugs towed large floating docks, played an important part in transporting the various sections from which the invasion or "Mulberry" harbours were built up, assisted in laying "Fluto" (pipeline-under-the-ocean) across the English Channel and convoyed ships. Many tales of good seamanship could be told of how the tugs assisted ships torpedoed or mined in mid-ocean.

The Dutch towage fleet suffered severe losses during the war, but it has since made a remarkable recovery. The present fleet of ocean-going tugs consists of twenty-four vessels, of which sixteen are powered by engines of 1,000 to 4,200 horse power. Most of these have a cruising range of 14,000 to 18,000 nautical miles. Their heavy duty towing and salvage gear and navigation aids incorporate the very latest methods known to maritime science and marine engineering. The crews' accommodation provides the maximum of comfort and is completely air-conditioned.

In the past eight years Dutch tugs have played a notable part in establishing long-distance towing records. When in 1950 the Port of Melbourne required extension to cope with increasing shipping tonnage, a Dutch dredging company was entrusted with the work and the tugs "Rode Zee," "Humber" and "Noordzee" set out from Holland towing the required dredging craft, completing a 13,000 mile voyage without a single hitch. The new dredger "A. D. Mackenzie" built on the Clyde for account of the Melbourne Harbour Trust Commissioners, arrived at its destination in January 1952 towed by the tug "Noordzee," after a 113-day voyage.

Another speciality is the towage of floating drydocks. Since 1892 Dutch tugs have towed to all parts of the world about 90 of these unwieldy units, including some of 30,000 and one of over 50,000 tons lifting capacity.

New Loading Pipelines at Kuwait.

Three new submarine pipelines have been commissioned at Mena al Ahmadi, the loading port at Kuwait. Four tankers can now load crude oil through submarine pipelines while moored to buoys and eight tankers can be loaded simultaneously at the main jetty. To feed the increased number of loading points two new gravity pipelines have been laid the five miles between the tank farm at Ahmadi and the port. The laying of the pipelines is part of the development scheme for Kuwait which resulted in crude oil production for the first 11 months of 1953 rising to 38,620,002 tons, compared with 34,067,141 tons for the same period in 1952.

Tonnage Measurement of Ships

The Propelling Power Allowance

In considering the Merchant Shipping Bill which has had its second reading in the House of Commons, and its bearing on the tonnage measurement of ships, it is important to have in mind precisely what the Bill comprehends. Its object is to provide for a modified system of measuring *propelling power space* in a ship, in the calculation of its net registered tonnage. It does not purport to deal with the general question of tonnage measurement. Total revision would be such a complicated business, as was indicated in the article which appeared in last month's issue of *The Dock and Harbour Authority*, that it is not likely to be attempted for years to come. Indeed, although British shipowners have been pressing for a long time for the propelling power allowance ("P.P.A.") to be modified, and have been able to get the support of their shipowning colleagues in the principal maritime countries, they have expressed the view quite firmly that there is no need to embark upon the far bigger and more complex task. For one reason alone—the reconciliation of divergent views among the shipowners of the world, dock and harbour authorities, canal companies and everyone concerned in collecting dues from ships—there will be considerable hesitation before such a project is agreed, let alone launched.

British shipowners welcome the P.P.A. provisions in the Bill. The present rules are in several respects inappropriate to modern engine-room design. It will be realised that a hundred years ago propelling machinery was much more cumbersome than it is to-day. The artificial increase in the P.P.A. allowance at the point where the engine-room space exceeds 13 per cent. on gross tonnage has been an inducement to owners and shipbuilders to produce ships not necessarily the most efficient for their purpose.

Screw-propelled ships with engine-rooms measuring between 13 and 20 per cent. of the vessel's gross tonnage get a flat deduction of 32 per cent. of the gross tonnage for the space occupied by the propelling unit and the bunkers. Outside these limits the deduction on account of propelling power space is one and threequarter times the actual size of the engine-room. Thus there is a great disparity between the allowance for ships with an engine-room just above 13 per cent. and those just below. Often it is worth while for an owner to have designed an engine-room larger than the engines really required so as to obtain the more favourable deduction. Take, as an example, two ships each of similar gross tonnage, one with an engine-room only 12 per cent. of the gross tonnage and the other with 13.1 per cent. of the gross tonnage. The former will get a P.P.A. allowance of only 21 per cent., but the latter will qualify for 32 per cent. Naturally, naval architects will tend to design ships with engine-rooms exceeding 13 per cent. of the gross tonnage regardless of the fact that as main engines have become more compact for any given horse-power, they can be housed in less space.

Shipowners have likewise aimed at obtaining the greatest benefit they can from the tonnage rules and thus engine-room spaces have often been made larger than is necessary for the efficient operation of the ship, so as to secure the extra percentage reduction allowed. Improvement in design and efficiency in modern propulsion units is still not reflected in a reduction in space and the big engine-room, unnecessary for operational efficiency, continues to be built, using larger quantities of steel and, in some cases, diminishing the safety standard of a ship. Speaking generally, the larger the engine-room the lower the safety factor, as the subdivision of the ship into watertight compartment is made more difficult.

The effect of the Bill will be to remove the sudden drop in the allowance at the 13 per cent. level and to provide for engine rooms which are less than 13 per cent. of the gross tonnage. In future, an engine-room measuring precisely 13 per cent. of the gross tonnage will receive the 32 per cent. allowance which is given at present in the range between 13 and 20 per cent. while the 12 per cent. engine-room will receive an engine-room allowance of 12/13ths of 32 per cent.

As was explained in the article published last month, registered tonnage is arrived at by deducting from a ship's gross tonnage the machinery, crew and other "non-freight-earning" spaces with the object of determining the freight-earning capacity. It is on this capacity that a ship is generally assessed for harbour, light, pilotage dues and so on.

It was because of the increasing handicap of the present rules to modern and efficient ship design that British shipowners joined with shipbuilders and naval architects in urging on the Minister of Transport the need for revision. They then had to consider the possibility of international acceptance of a proposal to change the P.P.A. rule among countries with reciprocal tonnage measurement agreements with the United Kingdom. These countries are: Belgium, Denmark, Egypt, Finland, France, Germany, Greece, Iceland, Italy, Japan, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, United States and the countries of the Commonwealth. There was a sufficiently favourable response to enable the British Government to introduce the Bill now before the House of Commons. Out of 28 Governments consulted, 26 agreed in principle, only Italy expressed disagreement and Russia has not yet replied. The Ministry of Transport also went to the trouble of consulting the seamen's unions about the proposals contained in the Bill. The particular matter of interest was the provision of adequate working space, lighting and ventilaiton in the smaller and more compact engine-rooms. Before a ship is given the more favourable allowance the ship surveyor must be satisfied as to these engine-room conditions. The Union representatives, when they realised the precautions to be taken, welcomed the Bill as a contribution to increased safety at sea.

As shipowners are concerned with obtaining a system of measurement which will operate to their advantage, both financially and otherwise, so dock and harbour authorities and other dues-collecting bodies are anxious that their revenues shall not be adversely affected. Is there any substance in the fear that they will be? The effect of the new rule will be that instead of aiming for the 32 per cent. allowance, shipowners will prefer to have smaller engine-rooms which will attract a proportion of the percentage under the tapering-off scale. Therefore, in cases where the propelling power space is under 13 per cent. the result will be a slight increase of registered tonnage and therefore of liability for dues. From the shipowner's point of view, this will be more than offset by increased safety and carrying capacity and by reduced construction costs. Mr. Shinwell, in the second reading debate on the Bill, suggested that if, through the alteration of the P.P.A., more shipping is employed in our docks and harbours, the authorities will gain an eventual advantage.

Anxiety was expressed in the debate as to whether the revised P.P.A., by permitting more cargo to be carried, would affect the load line and reduce the factor of safety, but the assurance was given that the law concerning load lines would be in no way affected and there was no question whatever of reducing the margin of safety in that respect.

The ships most likely to benefit by the provisions of the Bill are tankers. At present it is estimated that about 4 per cent. of British ships have engine-rooms of less than 13 per cent. The maximum which may be expected at any time, if the provisions of the Bill are as satisfactory as it is hoped they will be, should be increased to something like 10 per cent., but that 10 per cent. may be extremely important because it will consist chiefly of tankers.

Fighting Fires in Ships.

In the course of an address to the Association of German Engineers, the head of the Hamburg Fire Department said that over 200 ship Fires had occurred in the port of Hamburg since the end of the war. In more than 90 per cent. of the cases carelessness was the cause—for example, during welding operations or owing to faulty electrical equipment on board. The speaker pointed out that fighting fires in ships was more difficult than on land; heavy smoke not only prevented the firemen from finding the seat of the fire but interfered with their work. Fire-protection measures on board ship were much less than on land; for instance, in a 45,000-ton tanker worth 35 million marks (£3,000,000) only 50,000 marks was spent on fire-protection equipment. Ashore, 10 per cent. of the cost of a building was often spent on this, whereas in ships it was often less than one per cent. In his opinion the international safety regulations should be made more strict.

The Hawkesbury River Highway Bridge, N.S.W.

Description of Construction of Piers and Erection of Superstructure*

By A. R. SHEPLEY, B.Sc., B.E., M.I.E.Aust.

(continued from page 283)

Pile Foundations, Piers 3-11.

General.

Piers 3-11 involved work of a nature entirely different from that in the caisson at Pier 2, as they are founded on reinforced concrete piles, the heads being about 15 to 20-ft. below the river bed. Construction using a diving bell and compressed air was successfully used.

Details of Piers 3-11 are given in Table III.

TABLE III.

Details, Piers 3-11.

Pier No.	Size of pier base	No. of piles	Length of piles	Depth to natural surface from H.W.L.	Depth to bottom of excavation from H.W.L.	Test piles
	ft. ft.		ft. in.	ft. in.	ft. in.	ft.
3	50 x 27	72	110 0	36 0	57 0	1/120
4	38 x 14	24	100 0	28 0	46 0	—
5	38 x 14	24	93 6	27 0	44 0	1/101
6	38 x 14	24	93 6	26 0	43 0	—
7	38 x 14	24	89 0	25 0	41 0	1/97
8	38 x 14	24	86 0	24 0	40 0	—
9	38 x 14	21	83 6	23 0	40 0	—
10	38 x 14	21	82 0	21 0	35 0	1/97
11	38 x 14	14	83 6	20 0	34 0	—

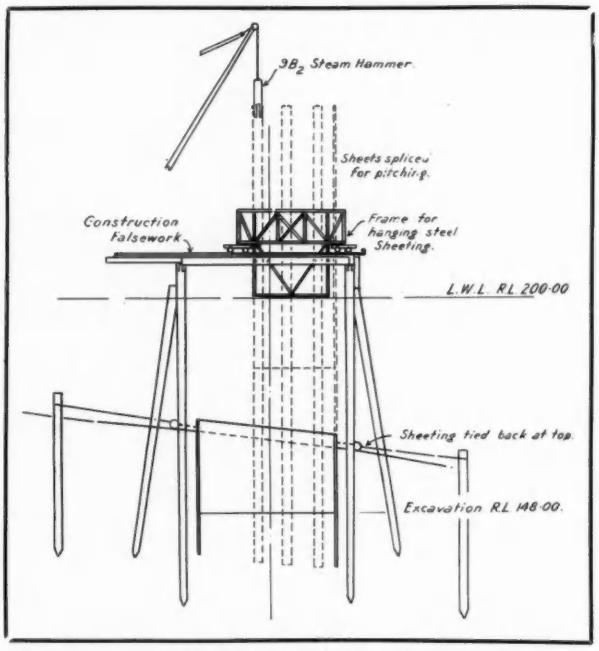


Fig. 11. Construction Pier 3—stages 1 and 2. Falsework piles driven and girdles placed. Steel sheet piling driven around pier site. Pier site excavated by grab.

The construction schedule comprised ten stages:—

(i) Temporary falsework constructed to carry pile driving plant, etc.

(ii) Interlocking steel sheet pile cofferdam enclosing pier site driven and excavated to plan depth.

(iii) Permanent reinforced concrete piles driven from falsework.

(iv) Lagged anchor frame lowered around pile heads.

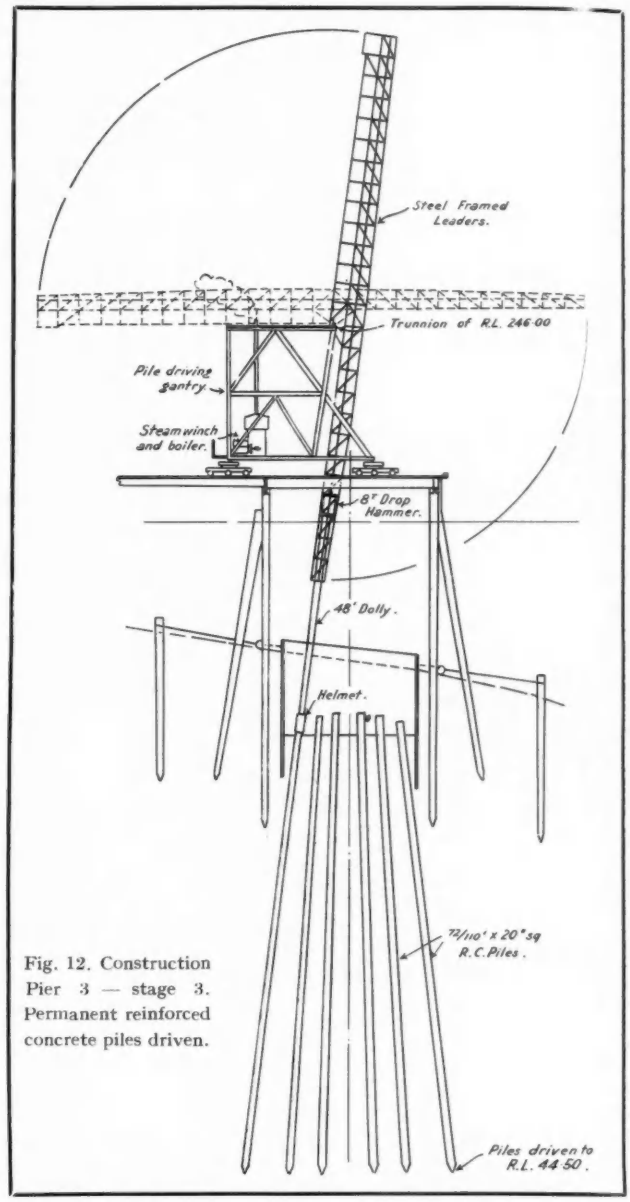


Fig. 12. Construction Pier 3 — stage 3. Permanent reinforced concrete piles driven.

(v) Concrete placed under water to seal anchor frame to permanent piles.

(vi) Fabricated steel diving bell bolted to anchor frame by diver.

(vii) Air lock flumings and air locks fitted, and compressed air pumped into diving bell.

(viii) Seal concrete cleaned, pile heads stripped, reinforcement placed and concrete poured in base, under compressed air.

(ix) Diving bell removed and cylindrical steel flumings reaching above water bolted to shaft bases by diver, and pumped out, and concrete in shafts poured in open air.

(x) Sheet piling removed, flumings stripped, and pier completed.

Figs. 11, 12, 13, 14 and 15 show the various construction stages of Pier 3, described in more detail hereunder.

*A paper read before the Tasmanian Division of the Institution of Engineers, Australia, reproduced, slightly abridged, by kind permission.

Hawkesbury River Highway Bridge, N.S.W.—continued

Construction of Cofferdam.

Steel sheet piling about 35-ft. long was used for this cofferdam, which was larger than the others. The layout of the falsework was such that the procedure used for cofferdams in Piers 4-11, namely hanging and interlocking the complete dam before lowering, could not be used in Pier 3. Sheets were hung and driven in four sections, that is each corner of the dam separately. The end sheets were spliced to make them 64-ft. long and were lowered as slack water. Other sheets spaced at intervals were similarly lengthened and lowered, and part driven. Guide sheets having been thus placed the intermediate unspliced sheets were lowered and driven to full depth, using a McKiernan-Terry 9 B2 steam hammer operating under water. The spliced sheets were next driven, and as the tops of the lower sheets were about 2-ft. above mud line, the splices were accessible for unbolting by the diver. The end sheets in each corner section, however, were left spliced until the sheets for adjacent corner had been placed and driven.

For Pier 3, before excavation, the tops of the sheets were anchored to timber piles driven some 30-ft. from the sheeting. See Fig. 11. In this pier the sheeting had a maximum depth of 21-ft. of material against it and was subject to considerable vibration during the driving of the permanent piles but measurements made periodically showed no appreciable movement of the sheet tops.

Permanent Piles.

The piles were 20-in. square, reinforced with eight 1⅛-in. dia. rods, ⅜-in. dia. stirrups at varying spacings and a cast iron point. Two lifting hooks were built in 3-ft. 6-in. from the head for hanging in the pile leaders. The piles were lifted seven days after casting and stacked for further curing. Piles were at least 21 days old before driving; the 28 day tests on concrete gave an average of about 7,000 lb. per sq. in. Lifting beams were used to give equalised support at four lifting points when handling the piles.

Pile Driving Plant.

The piles were pitched by, and driven from, a set of U-shaped welded-steel leaders, which pivoted on a trunnion near the centre point. The leaders could also be slewed on a centre pin so as to pitch side batter piles. The rig was supported on a steel carriage which could move laterally, the whole being supported on the top of a timber gantry frame about 30-ft. high, which was mounted on wheels travelling on rails on the temporary falsework. This method of mounting allowed the leaders to be set to drive piles either vertically, or battered in any direction. The gantry equipment comprised a 30 h.p. vertical boiler, triple-drum 5-ton steam winch, double-drum 3-ton steam winch, water pumps, welding plant, hand winches for travelling, and water and fuel storages. Fig. 12 shows the plant set over Pier 3, and Fig. 16 a view with the leaders tilting to pitch a pile.

The piles were lifted into the leaders by the lifting beams in the horizontal position, by a 35-ton floating sheer legs rig. Lowering tackle in the leaders was attached to the hooks in the head of the pile, and the leaders turned over into correct position for pitching the pile. The hammer was then transferred from the back leaders where it was placed while the pile was being pitched, to the front leaders, and rested on the dolly above the pile.

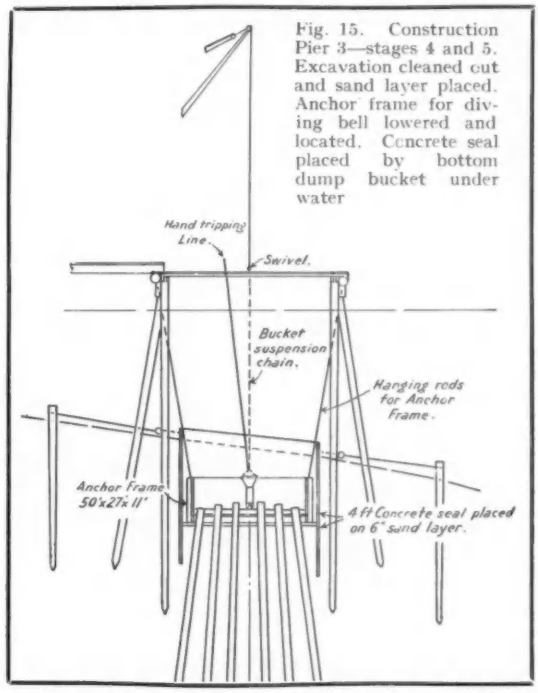

Hand tripping Line.
Swivel.
Bucket suspension chain.
Hanging rods for Anchor Frame.
Anchor Frame 50'x27½' 11'
4 ft Concrete seal placed on 6" sand layer.

Fig. 15. Construction Pier 3—stages 4 and 5. Excavation cleaned out and sand layer placed. Anchor frame for diving bell lowered and located. Concrete seal placed by bottom dump bucket under water

A welded steel helmet was used with a diaphragm of 4-in. M.S. plate free to move inside the helmet shell between the packing on the head of the pile and the dolly. About 12-in. of oregon boards in layers of 1½-in. to 2-in. was used as packing.

As the piles had to be driven below water level, it was necessary to use dollies, which at Pier 3 were 48-ft. long and of ironbark. The number of piles driven by one dolly varied from 3 to 27. Restarting a pile which had "frozen" before reaching contract depth was particularly severe on the followers, so every effort was made to ensure that once driving a pile commenced there was reasonable expectation of completing it in a continuous operation.

Driving was by a drop hammer weighing 8 tons, operated through a two-part tackle from the 5-ton steam winch. The hammer drop was varied to suit driving conditions, from about 2-ft. 6-in. to a maximum of 7-ft. 6-in. For testing, a free fall of 6-ft. 3-in. by means of a tripper with a blow of 50 ft.-tons, was used.

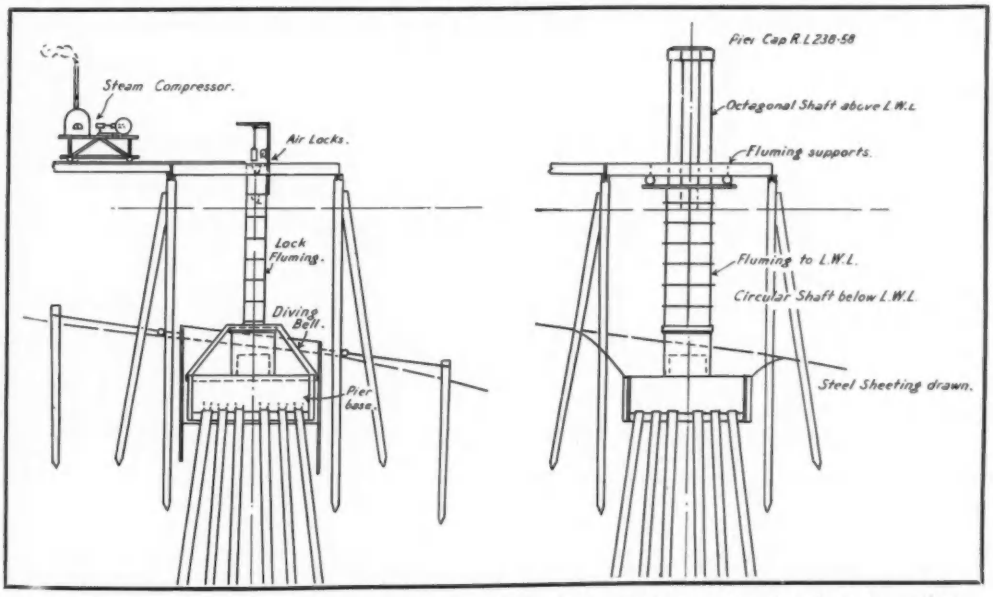


Fig. 13 (left) Construction Pier 3—stages 6, 7 and 8. Diving bell lowered and bolted to anchor frame. Air locks and fluming attached to bell. Pier stripped, reinforcements placed and concrete poured in pier base. Fig. 14 (right) Construction Pier 3—stages 9 and 10. Diving bell removed, pier shaft flumings bolted to matching piece. Flumings pumped out and concrete placed to H.W.L. Pier completed above H.W.L. Flumings and falsework removed and steel sheeting drawn.

Hawkesbury River Highway Bridge, N.S.W.—continued

Test Piles.

Test piles were driven in Piers 3, 5, 7 and 19. The test pile in Pier 3 was 120-ft. long, and weighed 24 tons. When pitched and lowered, it penetrated 10-ft. 6-in. into the ground, and supported its own weight and that of the helmet. Three light blows with the hammer were given with about 2-ft. 6-in. drop, and caused a penetration of 3-in. after each of the first two. After the third blow, the pile commenced to move, accelerated, and penetrated 63-ft. Similar

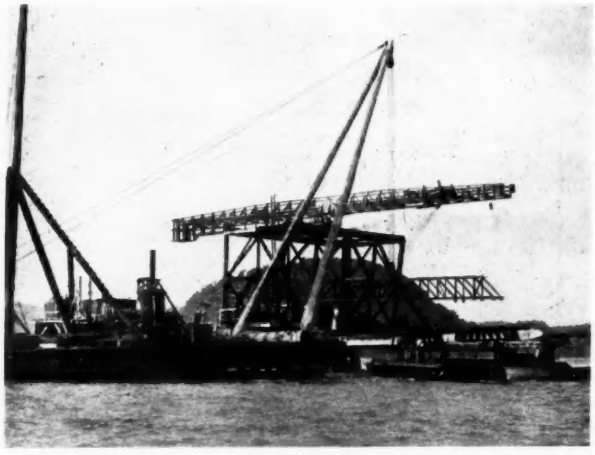


Fig. 16. Plant for handling and driving reinforced concrete piles.

runs occurred in nearly all piers when starting the piles, but 63-ft. was the maximum.

A pile driven in Pier 7, gave a $\frac{3}{4}$-in. test when driven. The Department of Main Roads tested it some weeks after driving with a hydraulic jack by means of a special rig and it withstood a load of 90 tons for a short period without settlement. The maximum designed loading on the piles is 45 tons in Piers 4-11, and 56 tons in Pier 3.

Locating Piles in Pier 3.

All 72 piles in Pier 3 were driven on a batter, except the original test pile, which was vertical. The batters were arranged both longitudinally and transversely, and were 1 : 32, 1 : 16, and 1 : 8 in the different rows, the greatest batter being in the outside rows. The nominal spacing of the piles was at 4-ft. 2-in. centres.

As satisfactory placing of the anchor frame for the diving bell depended on setting the steel joists to clear the piles, before making up the anchor frame, the positions of the piles were checked. This was done from a grid above water level, and using a plumb-bob weighing 150 lb. The diver directed the movements of the plumb-bob until it hung centrally over each pile, and the grid position was noted. The layout of the anchor frame joists was determined from a plot of the pile positions, which were afterwards checked inside the diving bell. The accuracy of this method was quite good, the general error being less than 1-in. with a maximum of 3-in.

Anchor Frame for Diving Bell.

The diving bell anchor comprised 13 U-frames of 20-in. x 6½-in. A.S.B.'s, to which 9-in. x 4-in. A.S.B. posts were welded at each end. Horizontal joist spacing was determined as described above, and the sides and ends of the set were lagged with 2½-in. hardwood to form an open box, 50-ft. x 27-ft. x 11-ft. The outside was sheathed with felt and galvanised iron, with soldered joints to make it watertight against external pressure.

The frame weighed 32 tons and was lowered over the pier base inside the steel-sheet-piling cofferdam. It was suspended by four rods from the falsework, checked for level and position, and found to clear all the piles and to be substantially correctly placed. Later checks in the diving bell showed the frame 3-in. downstream and 1¼-in. south of the plan position.

The piles were sealed with concrete 4-ft. deep inside the anchor frame on a layer of sand 6-in. thick, after cleaning the excavation. Bottom dump buckets of special shape to ensure that they would go between the pile heads were used. These were fitted with canvas covers to protect the concrete as far as possible when being lowered. The nominal 1 : 1½ : 2⅔ mix with a slump of 3 in. was used, and examination later showed that it had flowed around the anchor beams and piles exceptionally well. This stage is illustrated in Fig. 15.

Diving Bell.

The diving bell was of welded steel with internal framing carrying a plate outer shell. It was bolted to the posts of the anchor frame, and overlapped the lagging of the anchor frame by 12-in. The seating was excellent, and except for the fact that the atmosphere was nearly 100 per cent. saturated, the whole of the placing of the pier base was done in the dry.

The bell weighed 40 tons when fabricated. It was suspended by tackles underneath a punt 66-ft. x 24-ft. when transferring it from the fabrication site to the pier and lowering it over the anchor frame. The diver fitted the fifty-two 1¾-in. dia. T-headed holding down bolts between the caps of the posts of the anchor frame and bell. Slotted holes gave a reasonable degree of adjustment for this.

The uplift on the anchor frame, was 680 tons, 450 tons from the diving bell and 230 tons from the portion inside the lagged frame. This represented about 9½ tons per pile, and required a bond of 800 lb. per sq. ft. between piles and seal concrete. Anchorage was improved by all the piles having a batter through the 4-ft. thick concrete seal.

Air locks for men and for materials, were fitted. Compressed air was supplied by a steam driven compressor, with a standby petrol plant. Lighting was by a 65-volt petrol plant. High pressure air for operating air tools, and pressure water were also provided

Fig. 17. Inside diving bell at Pier 3—cleaning up floor.

inside the diving bell. There was practically no leakage, and conditions generally were very good. Fig. 13 shows this stage. Pile heads above the concrete seal were broken down and the reinforcement bonded into the base slab. Reinforcement was placed over and between the piles, after laitance and silt had been cleaned up. Vertical reinforcement for the bases of the two pier shafts was also set. The pier shafts, chainage and centre lines were transferred from the falsework adjacent to the pier by plumbing through the air locks. The pier base was 3-in. downstream and 1¼-in. south of plan position, as mentioned earlier.

Hawkesbury River Highway Bridge, N.S.W.—continued

The base slab 50-ft. x 27-ft. x 7-ft. deep completely filled the lagged anchor frame and was poured in three lifts of 2-ft. 4-in. with keys between lifts 6-in. x 3-in. at 1-ft. 6-in. centres. Concrete was lowered through the material lock in a 10 cu. ft. bucket and distributed by chutes and shovelling. The bucket cycle averaged about two minutes and the pouring rate about 12 cu. yd. per hour. The working chamber was flooded after each lift to cool the concrete before placing the following lift.

Pier shaft and brace forms were set, having been prefabricated for easy transfer through the air locks and re-erection inside the bell. Steel matching rings for the attachment of steel flumings in which to pour the pier shafts to water level were set for level and position. The matching pieces and flumings had been checked for easy reassembly by the diver after removal of the diving bell, and as the matching pieces were too large to pass through the air locks, they had been suspended in approximately the correct position in the ceiling of the diving bell before it was lowered Similarly, all long and heavy reinforcement, timber and other materials which could be handled in this manner had been lowered inside the bell.

Figs. 17 and 18, photographs taken inside the diving bell, show this phase of the work. In Fig. 17, cleaning of the floor was in progress after breaking back the piles; the air lift pumps are in the background; reinforcement and a matching piece are suspended from the bell. The construction of the anchor frame and the bell itself can be seen. Fig. 18 shows a later stage of the work, reinforcements having been set prior to pouring the concrete in the base slab.

Work inside the diving bell proceeded quite smoothly. The pressure, about 20 lb. per sq. inch., was a comfortable working pressure, and no trouble with " bends " was experienced except for one or two minor cases.

Completion of Pier 3.

After removal of the diving bell, by reversing the process by which it had been placed, the steel shaft flumes were attached to the matching pieces by the diver. A perfect seal which withstood 36-ft. head of water was made by using a ring of 1¼-in. hose. The flumings

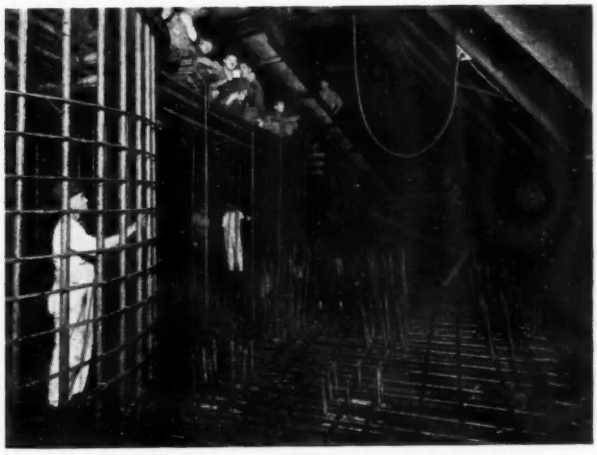


Fig. 18. Inside diving bell at Pier 3—reinforcement placed ready for concreting.

were pumped out and the vertical reinforcements spliced in screw connectors which had been attached to the upper ends of the bars set in the diving bell. Completion of the pier was relatively simple. See Fig. 14.

The steel piling of the cofferdam was extracted using a McKiernan-Terry No. 6 steam hammer with extracting gear, and the 35-ton floating sheer legs rig.

Summary.

The diving bell method is most economical when a number of piers with identical base dimensions have to be constructed as was the case with Piers 4-11, which were all 38-ft. x 14-ft. For these piers the method was a little different, the diving bell was sealed to the top of the anchor frame, and the outlet point was arranged for sufficient pressure to dislodge the water over the concrete seal, instead of pumping it out. Otherwise, except that the bell and appurtenances were smaller and more easily handled, the process was the same. The anchor frame, in each pier, is not recovered, but its cost is comparatively small. Compressed air supply cost is probably no more than pumping costs for an open cofferdam and thin seal under a relatively high head.

Under compressed air the whole of the essential work of constructing the pier base is carried out in the dry, and as there is no necessity to hurry against the possibility of leakage developing, a much better job can be done. The working chamber is clear of strutting and other obstructions, and the whole scheme is positive and lends itself to accurate work and adequate supervision.

Superstructure

Truss Spans.

The method of erecting and placing the main truss spans is of interest. The trusses are K-braced, curved chord, 438-ft. 8-in.

Fig. 19. Truss span in course of erection.

between centres of bearings, 67-ft. 6-in. between centres of chords at midpoint. All truss members were fabricated from plates by shop welding, by the Clyde Engineering Company to the designs of the Department of Main Roads and the trusses were shop erected before despatch to the job. All main riveted joints were made with 1⅛-in. dia. rivets.

A description of the steelwork in the truss spans is given in the paper " 438-ft. Span Welded Truss for Hawkesbury River Road Bridge," by V. Karmalsky, A.M.I.E.Aust., in " The Journal of The Institution of Engineers, Australia," Volume 17, March, 1945.

Erection of Truss Spans.

The truss spans were erected on falsework on the northern side of the river and transferred to their final positions by floating on punts. Portion of the falsework from Pier 10 to the northern abutment, which was necessary for construction of the permanent piers, was arranged so that steel erection trestle-work could be built thereon, and the truss spans, in turn, erected.

This gantry was 90-ft. high to clear the truss span at its centre point, and was capable of lifting 25 tons. A steam winch on a punt alongside provided the power required, through appropriate rigging.

The spans were erected at a height and on a grade which allowed of their being transferred from the erection trestles to their final positions on the piers by floating on towers on punts. They were completely riveted before flotation except for the downstream ends of the lateral bracings, which were temporarily bolted. The spans as floated weighed 640 tons, the roadway stringers and footway being placed after landing. Fig. 19 shows a truss span in course of erection.

Hawkesbury River Highway Bridge, N.S.W.—continued

Truss Bearings.

Each span had one fixed and three expansion bearings. The fixed bearing for Span 2 is on Pier 1, and that for Span 3 on Pier 2. The hemispherical bearings are of cast steel, 18-in. diameter, of ball and socket type, the sockets being fixed to the underside of the trusses. The expansion bearings are rockers of 24-in. radius, surmounted by 18-in. dia. hemispheres. The bearings were set and grouted into position on the piers after checking the overall length of the spans as erected, and making allowances for the stretching of the bottom chord under load conditions.

Floating Span to Position.

To transfer each span from the falsework to its position on the piers, two punts, 100-ft. x 30-ft. x 9-ft., were used. On each punt a timber tower was erected to distribute the load. This tower and incidental gear weighed 85 tons, making the total load on each punt 425 tons. Water ballast tanks above deck level were used to increase the draught of the unloaded punts, to facilitate placing them under the spans at low tide. The span was lifted at eight points, welded steel pedestals having been attached to the underside of the chords for lifting. Timber packing blocks were placed between the tops of the towers and the pedestals as soon as the punts were correctly positioned. Clearances were small and care was necessary to ensure that the towers would not foul the erection falsework when the punts were drifted out. The punts were hauled clear to the downstream side by hand winches and a punt with steam winches mounted was made fast alongside each one when clear. By hauling on lines attached to the falsework and previously established anchors, with the steam winches, the span was moved across the river towards the final location. Fig. 20 shows this operation in progress.

The span was lifted from the falsework at high tide, and having been moved during slack water, on the following high tide 24 hours later was placed over the bearings on the piers. As the tide fell the span landed on the bearings. Tackles mounted at each end of the span enabled the final location to be effected with ease and

Fig. 20. Floating truss span into position between Piers 1 and 2.

accuracy. Each span was floated at a grade different by 5-in. from its final grade, arranged so as to ensure that the fixed bearing would engage first. When the weight came on the bearings and the span was "swung," the bottom chord extended $\frac{7}{8}$-in.

The punts were removed from under the span by filling the ballast tanks and also by pumping water into the punts. Stabilising punts were attached to the main punts as a precautionary measure before drifting clear of the span, and until the water inside the punts had been pumped out again.

The roadway and footway steel was erected after the spans were in position and the concrete deck poured. The downstream ends of the lateral bracings were then riveted.

The spans when erected on the falsework had a camber of 12-in. This reduced to 9½-in. when the span was "swung" after floating into position, and on completion of the decking was 6½-in.

Other Sections of Work.

Piers 12-18.

These comprise trestle pile bents, with piles 22-in. square, maximum length 102-ft. They were driven from falsework as the piles in Piers 3-11, except that they were left standing above water level. Some trouble was experienced with these piles, as cracking occurred during driving, due apparently to vibration in the long

Fig. 21. General view of completed bridge from Sydney side.

unsupported length of pile, and the ratio of weight of the hammer to the pile being too low. The piles are capped with reinforced concrete headstocks in the usual way.

Spans 1 and 4-11.

These spans are welded web deck girders, fabricated in the shop and delivered in single lengths. Spans 4-11 are 90-ft. long and weigh 17½ tons, and were erected by the 35-ton sheer legs rig. The deck is generally similar to that on the truss spans.

Spans 12-18.

These are 24-in. x 7½-in. R.S.J. spans, 40-ft. overall, with the deck cast on the top flange, the erecting being simple. Fig. 21 shows the completed bridge.

Conclusion

Although floating the truss spans was probably the most spectacular feature of the job, the underwater work involved in joining the two sections of the caisson at Pier 2 together, and in driving the piles and building the base for Pier 3, were much more hazardous and difficult. Incidental problems in connection with these operations had to be solved and there were also the hazards associated with floating plant under conditions of wind, tide and flood throughout the period of construction.

Work commenced in November, 1938, and the bridge was officially opened for traffic in May, 1945.

Acknowledgments

The Hawkesbury River Bridge was designed by the Australian Government Department of Main Roads. The work described in the paper was carried out by the contractors, Balgue Construction Pty. Ltd., and the contract was supervised at the site by engineers of the Department.

The contractors originated the idea of the diving bell method of pier construction on permanent piles and were responsible for the design of the pile-driving and handling equipment.

The author of the paper was construction engineer with the contractors on the site from January, 1940, until February, 1945, during which period the building of Pier 2 caisson and the remainder of the substructure was carried out, as well as the erection of the superstructure.

Pest Control Developments in the Port of London

With Special Reference to "1080" and Insecticidal Lacquer*

By T. L. MACKIE, M.B.E., M.I.N.A., M.S.I.A.
Chief Inspector, Port of London Health Authority

LOOKING in retrospect provides ample evidence to indicate that port health authorities have become increasingly "pest control" conscious during the past decade. Several factors have contributed to this progressive change, including education, legislation, the demands for improved standards of sanitation, scientific discoveries and the urgent need to reduce losses caused by pests. As a result, some port health staffs have been strengthened and organised to cope with the increased demands resulting from new information concerning rodents and insect pests and new methods of combating them. There is now a wide range of lethal substances available to operators and operational technique has been developed accordingly.

The old-time method of fumigating by burning sulphur has been largely superseded by hydrogen cyanide. Many of the proprietary insecticidal substances alleged to possess the power to exterminate, have faded into disuse and have given place to the provedly efficient chlorinated hydrocarbons and pyrethrins.

Of the present day rodenticides such as phosphorous and arsenical compounds, red squill, barium carbonate, "Antu," zinc phosphide and warfarin, not all can be considered really effective and some must now be regarded as museum specimens. However, the "breakback" trap can still be a useful weapon for incidental operations.

Port health authorities are legally responsible for controlling ship-borne social insect pests and, in addition, the medical officer of health of a port which is defined as a "designated approved port" in the Public Health (Ships) Regulations, 1952. is empowered to exercise rodent control aboard ocean-going ships for the purpose of issuing an appropriate form of international certificate.

This field of activity is common to all major ports, but the Port of London Health Authority is committed to another and unusual task. In agreement with the Port of London Authority, the Health Authority has undertaken to organise a comprehensive rodent control scheme which embraces all their premises within the groups of docks operated by the Port of London Authority and their tenants. The same arrangement has been made with the Regents Canal Dock Company. This development has proved itself to be a major success around which there has arisen an atmosphere of goodwill and understanding between all concerned. A rat is now recognised as an intruder to be destroyed, in sharp contrast to the belief that a rat infestation is normally associated with docks and warehouses.

It will be readily appreciated that rodent control has become a responsibility of considerable significance in the Port of London, where every type of rodenticide and operational method is explored ashore and afloat in search of the best and possibly the ideal specific substance. During the past few years, zinc phosphide baits in various forms have been investigated and warfarin, in both powder and liquid form, has been put to test on numerous occasions. Notwithstanding the favourable rodenticidal qualities of these compounds, they have failed to satisfy the overall requirements in this port, which aims at exterminating as quickly and completely as possible. The business of a seaport imposes this condition on a rodent control scheme.

Consider the usual conditions obtaining in this large port. Passenger ships and freighters from global sea routes and coastwise ports are entering and leaving the port almost continuously. Many have arrived directly from seaports with rodent attractive cargoes or seaports which are liable to harbour plague infected rodents, while the steady flow of coastwise traffic often carries consignments of trans-shipped cargoes of the same nature.

Almost at once, the movement of cargo commences: wharves are filled, and in many cases the cargoes of ships may be directly loaded into railroad or roadway trucks and river craft. Time for decision and action is often fleeting and, having discovered the evidence of rodents, the operator must take prompt action.

Although he is armed with considerable mandatory power, the wise operator considers also the shipowners' and traders' position. Interference with healthy trade practices should be reduced to a minimum commensurate with the action required and delays to shipping avoided if possible.

As a rule, the first evidence of a rodent infestation is discovered aboard the ship while cargo is being discharged during daylight hours. In some instances the rodents will make inroads and harbour in suitable packages of the merchandise, consequently they are transported into the wharf or vehicle, while others will scurry into a secure space in the ship's hold. Any successful deratting will best be achieved during the hours of darkness under undisturbed conditions, whether between the cease-work hour of the day and the daylight of the following morning, or on more rare occasions over a weekend. These conditions apply to ships and warehouses alike.

A summary of the foregoing indicates that the following conditions must be fulfilled for a high degree of success in this work.

(1) A rodenticide which ensures a quick "knock down" without a system of pre-baiting.
(2) Preferably a liquid rodenticide which has no repelling influence, but possessing properties which will attract rodents.
(3) A redenticide which can be dispensed safely by exercising reasonable care.

More recently, efforts in pest control have been mainly concerned with rodents and cockroaches, in the hopes of discovering a means of deratting ships quickly without disturbing the crew, thus obviating the need to put the crew ashore, as in the case of a hydrogen cyanide fumigation and to treat the cockroach infestation separately with an insecticidal formulation capable of a quick "knock down" and a persistent toxicity. Extensive exploratory tests have been made in both fields with satisfactory results.

For comprehensive rodent control purposes, sodium-fluoroacetate, which is better known as compound "1080," has proved to be the most effective poison bait, and a lacquer which is impregnated with selected insecticides has awakened new ideas for exterminating cockroaches aboard ships. More about this lacquer treatment later.

"1080."

Properties. It is a fine, white, inert powder, highly soluble in water and resembling starch in appearance. It is hygroscopic, which necessitates its storage in an airtight container suitably labelled and, because of its fineness, it must not be weighed out in any place swept by draughts. In any case, a suitable gauze mask or respirator should be worn during the dispensing operation in order to prevent any floating particles of the powder being inhaled.

In a water solution as a rodenticide, it is colourless and odourless unless some extraneous dye is added as a warning signal. The taste is a matter of conjecture. It is chemically stable and is not found corrosive to metals. "1080" will decompose when heated above 200°C. and should never be heated in excess of 110°C. At field concentrations, it has no germicidal properties nor does it appear to destroy plant life.

Physiological Effects. Compound "1080" exerts its action on the heart muscle and central nervous system, the latter being manifested by epileptiform convulsions. The rat exhibits the following conditions after taking a fatal dose:—

Sensory disturbances, tremors, convulsions, paralysis, then coma. Haemorrhagic discharges sometimes occur before death and are generally found internally at a post-mortem examination. The interval which elapses between poisoning and death will naturally depend on the amount of poison taken, but as little as one cubic centimetre of the solution will kill within half an hour and often in a matter of a few minutes.

"1080" is not absorbed through the unbroken skin, but can be absorbed through cuts and abrasions of the skin. In any case

*A paper read at the 60th Annual Conference of the Sanitary Inspectors' Association, London and reprinted by kind permission.

Pest Control Developments—continued

it should always be handled with great care and protective rubber gloves worn to reduce the risk of contact with the skin. The hands should be washed immediately after handling " 1080 " in whatever form it is used and anything that might convey the poison to the mouth, e.g. smoking, should be forbidden. Food should not be eaten until the hands have been washed, even if gloves have been worn.

There is no known readily applicable first aid antidote for this poison.

From the foregoing details it seems reasonable to deduce that there are limitations to the scope afforded to the absolutely safe usage of " 1080." Such activities should be confined to selected types of premises and the distribution of the poison rigidly controlled. Access to site by the public or workers, and by all animals, must be prevented during the poisoning operation.

The preparation of baits involving the use of "1080" powder should always be carried out in a central office or laboratory and not in the field. Baits ready prepared or watery concentrates only should be despatched to the site of operation, *not* the powder.

Application. As a preliminary test, pairs of identical dishes were placed near rat runs in stubborn, slightly infested premises. One dish of each pair contained clean drinking water and the other an equal amount of colourless " 1080 " poisoned water at a concentration of 0.25 per cent. Rats were poisoned and there was ample evidence, as indicated by tracking dust and liquid consumed, that the rats showed some preference for the poisoned water.

Observations made at poisoning incidents confirmed that there is no " bait shyness " and the rats took a lethal dose before realising any symptoms of poisoning.

Rats must drink, therefore wherever possible, liquid poison bait has been used. It is attractive and, unlike a solid bait, it is not carried away in the mouth of the rodent and liable to be dropped elsewhere.

Solid baits, however, can be soaked in a solution of 0.5 per cent. concentration and used as an alternative when liquid bait would obviously be unsuitable, e.g. in open spaces. Generally, liquid bait is highly successful for inside work, especially where food is available and soaked cereal or sausage rusk will succeed in outside operations. Ships and food warehouses are among the former, and the latter include open sites, refuse dumps and sewers. Ships and barges have been effectively deratted overnight without any inconvenience and various infestations ashore, which hitherto have defied all other poisoning measures, have quickly succumbed to this treatment.

A successful system for continuous control of warehouses has been developed in several instances and, in order to avoid contamination of wares and human interference, the poison and equipment is contained in suitable boxes which are secured on familiar rodent runs. The poison dishes are fed automatically from a bottle within the box (see Figs. 1 and 2).

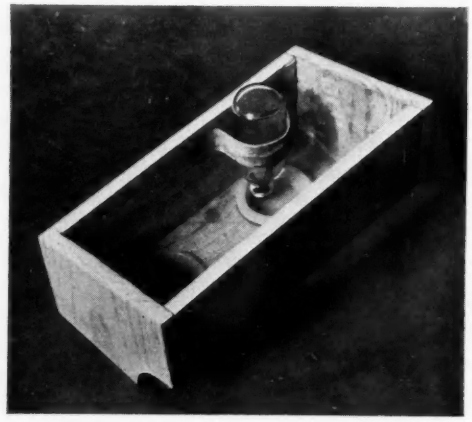


Fig. 1. " 1080 " poison bait station with gravity feed flask (interior view).

To cope with climbing rodents, another feature of continuous control has been developed in the form of a feeding bottle. By this method there is no loss due to evaporation. The container with its bottle is secured at a safe and suitable point on a wall beam or roof framework (see Fig. 3).

The normal pattern of an operation has been to place an adequate number of dishes containing one fluid ounce of the poison in such a manner as to intercept rodents and invite them to drink.

Equipment. All the equipment in service is of an unbreakable nature and easily washable. The flasks, funnel and dishes are made of "polythene" and are contained in an aluminium case. The dishes are uncrushable, which is an important factor in warehouse operations (see Fig. 4).

Instructions on the use of " 1080 " in the Port of London.

Responsibility

1. This rests primarily with the sanitary inspector in charge of the district.

2. One rodent operative only to be the regular custodian of the equipment, and the dispensing of " 1080," its distribution, storage and stock records, under the control and supervision of the sanitary inspector referred to above.

3. Any defective equipment or accidental loss of " 1080 " must be reported to the sanitary inspector forthwith.

4. All equipment and stock of " 1080 " to be kept in a locked cupboard or case.

Initial Procedure

5. The 6 fluid ounces of concentrated liquid " 1080 " is sufficient to make up 160 ounces (one gallon) of poisoned water at a concentration of 0.25 per cent.

6. Protective gloves must be worn when dispensing " 1080."

7. No " 1080 " must ever be contained in any equipment other than that officially provided.

8. Dispensing must be carried out in such a place and in such a manner as to prevent any spilling or splashing or other dangerous contamination.

Operation

9. All operations must be approved by the sanitary inspector.

10. Two rodent operatives should work together whenever convenient.

11. The person in charge of the premises must be notified of the operation details.

12. An accurate record must be made of all poison baits laid, e.g. type, number of points and quantity and each point clearly marked on the site.

13. Poison notices shall be displayed on the premises from the start to the finish of all operations.

Precautions

(To be strictly observed)

14. No operation shall be carried out in premises into which the public or domestic animals or birds have free access.

15. No poison points to be laid in precarious positions where spillage is liable to occur.

16. Protective gloves must be worn by the operative who handles the poison and dead rats.

17. Premises must be secured by the person in charge until unexpended poison and dead rats have been recovered.

18. Any accidental contamination must be reported to the sanitary inspector as soon as possible.

19. Gloves and hands must invariably be washed after handling " 1080 " or dead rats.

Final Procedure

20. All surplus poison shall be collected and returned to the bulk container on an open site, when solid bait shall be buried. *All poison containers laid must be accounted for.*

21. Dead rodents must be recovered and burned.

22. The person in charge of premises must be notified on completion of the operation and poison notices withdrawn.

23. All contaminated equipment except the interior of the bulk poison container shall be steeped in repeated rinsings of fresh water before returning it to the carrier.

Reports

24. An accurate report shall be rendered by the rodent operative in charge of the operation and submitted to the sanitary in-

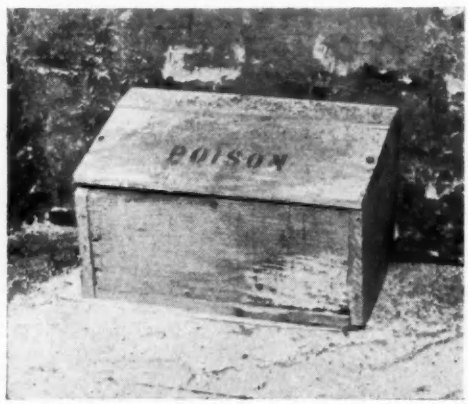


Fig. 2. Poison bait station in service.

Pest Control Developments—continued

spector before despatch to the central office.

Pest Proofing. Killing pests is not the final issue in pest extermination. Harbourage for these creatures must be eliminated, therefore " pest proofing " measures have not been overlooked in the pest control programme. Methods have been advocated by the Port Heatlh Authority aboard vessels and in warehouse construction. The main features have been invariably adopted and very few desirable details remain to be incorporated in the new warehouse construction.

Now for a review of the experimental work in connection with cockroach control aboard ships.

Insecticidal Treatment of Ships—A new formulation and technique.

Never in the annals of human endeavour has there been in recent years so much effort manifested and research conducted, with the object of eliminating insect pests that are considered to be vectors of disease communicable to man or invaders capable of sabotaging his economical welfare.

From time to time new chemical insecticides have been discovered and a technique investigated whereby the best results could be achieved always considering their lethal qualities and the economic factors when assessing the real value of their application.

An insecticide cannot be used indiscriminately. Its distribution and toxicity to man must be taken into account. Foodstuffs must not be contaminated.

There is also the fire hazard, the final appearance of the premises after treatment and any losses which may be sustained by decorative or fabric deterioration.

Taint and odour are always important considerations.

Whatever the obstacles to be overcome, and in most instances they have been dealt with successfully, the primary objective has been to provide a single treatment of an acceptable insecticide with powers to give a comparatively quick " knock down " and yet retain residual toxicity sufficient effectively to destroy future generations still in the egg stage and any other insects invading the treated site.

With the advancing standards of environmental sanitation aboard ship and in the light of new knowledge of insect-borne diseases, comes the greater need to rid ships of pests of all kinds. More attention is now being paid to the cockroach so often prevalent in the catering and messing quarters, if not generally dispersed throughout the ship. The cockroach, particularly the steam fly, is not easy to kill. The repeated treatment of ships while in port can be a laborious and costly business, while the hope of eradication by the persistent efforts of the crew during the voyage is not always successful.

The solution may be found in the application of a durable surface coating, which incorporates one or more effective insecticides relatively harmless to man, reasonable in price and readily available commercially.

In conjunction with a department of the

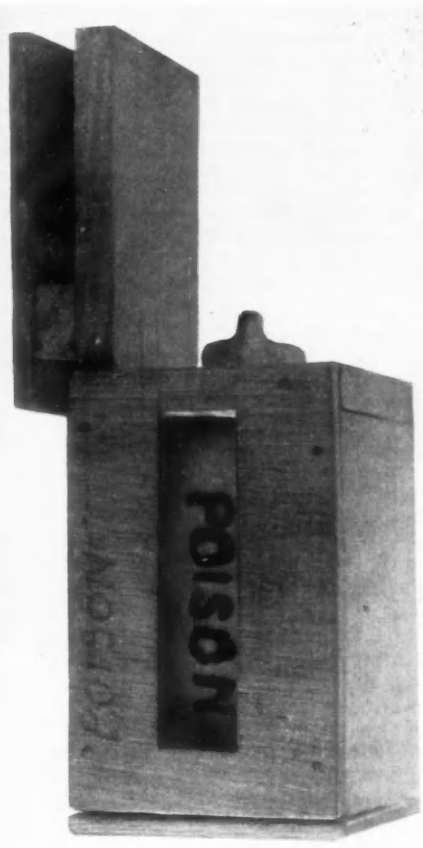


Fig. 3. Feeder bottle for use with " 1080 " on overhead runs.

Agricultural Research Council, several experiments have been carried out aboard persistently infested ships with an insecticidal coating of a type of urea formaldehyde resin and the results have been very encouraging, indeed almost dramatic.

Let me refer briefly to the remarkable properties of these lacquers in which an insecticide has been incorporated. The insecticide is, of course, evenly distributed throughout the lacquer and that part of the

Fig. 4. Complete " 1080 " outfit in light metal case.

insecticide on or near the surface will appear on the surface in crystalline form. Experiments with an ordinary paint in which an insecticide has been incorporated have shown that once the surface insecticide has disappeared the insecticidal properties of the paint also disappear. Not so in the case of the lacquer—any irritation of the surface of the lacquer will cause more insecticide to emerge in a manner known as " bloom." In the case of certain insecticides, such as D.D.T., this blooming is readily visible by looking at the surface of the lacquer obliquely. In other insecticides, such as Dieldrin, the blooming is so delicate as to be perceptible only with the aid of a magnifying glass. The reasons for this curious physical phenomena are not yet known. In any event the irritation of the surface of the lacquer either by an insect running over it, or in a grosser form by washing it down or even scrubbing it, has the effect of restoring the bloom and, moreover, over long periods of time. Incidentally, these lacquers can be washed down with an alkali, such as soda, or even acids, without affecting them or their insecticidal properties. It is this peculiar property of the insecticidal lacquer that renders it so valuable.

Urea formaldehyde resin is widely used in industry for clear and coloured lacquers to produce hard, durable and polished surfaces in a wide range of applications. The hardness of the surface is very important, since this factor governs the durability of the coating and the rate of insecticidal activity. One method of fixing the degree of resin hardness is by introducing a specific quantity of acidic accelerator immediately before using the resin, thus providing the correct consistency and resulting in a dry hard coat four hours after application.

The effective life of resin-bound insecticidal coatings depends on many factors, for instance, type of insecticide which is incorporated and the efficiency of dispensation. The more volatile types such as B.H.C. and Aldrin are more susceptible to deterioration when exposed to the elements and should, therefore, be applied preferably to sheltered sites. Both these insecticides are believed to kill by vapour action and do not produce a bloom. On the other hand, D.D.T. and Dieldrin have a low vapour pressure and presumably no effective vapour action. The crystals produced by them, however, are very stable, with considerable effective life on many types of surfaces, despite reasonable exposure to the elements, e.g. a twenty per cent. D.D.T. concentration and urea formaldehyde resin formulation has lived in an effective condition after nine months' exposure to wind, rain and sun. Further laboratory testing on absorbent and impervious surfaces like unpainted wood, painted surfaces, glass, brick and tiles has not indicated any insignificant variation of insecticidal performance.

Because of the residual insecticidal nature of the bloom produced, it is a treatment able to remain effective between the normal periods of decorating, when the lacquer can be applied as a clear film or pigmented to a

Pest Control Developments—continued

desired colour scheme. Both can be applied either by spray or brush, and the dosage per unit area varies according to the concentration of insecticide rather than by the thickness of the film applied. It is estimated that the cost of adding the insecticide to the resin increases the cost of the finished product by approximately ten per cent., the resin itself being reasonable in price owing to its commercial availability.

By using a residual insecticide such as D.D.T. or Dieldrin alone, or combining one or the other with B.H.C. or Aldrin, seems to afford a new approach to the scope for residual insecticides, in order to render fabrics permanently insecticidal for the duration of their usefulness and the lifetime of a decorative scheme. Bearing this in mind and the signal service which could be rendered to the shipping world, field trials have been carried out by the Health Authority aboard ships in the Port of London, particularly on those with a stubborn infestation of cockroaches (*Blattella germanica*) in the catering departments and crew's quarters. The desired objectives were to exterminate the insects by a knock down and to continue to observe the developments resulting from the treatments.

Accordingly, three formulations were dispensed, each having a common lacquer formula of resin, xylol and butonol, to which was added the following proportions of insecticide by weight:—

(a) 20% D.D.T. and 2% B.H.C.
(b) 10% D.D.T. and 5% B.H.C.
(c) 10% Dieldrin and 5% Aldrin.

All the ships given a treatment were freighters and two of them received a major treatment, one being a vessel employed to carry Mecca pilgrims and the other a troop transport. The " knock down " in each case was spectacular and the records of observation made at intervals on the ships trading regularly in the port, together with records submitted by the responsible officers of other ships have proved the remarkable qualities of the treatment. The first ship treated in January, 1952, for a major infestation, has continued in a clean condition for one year, according to the last report submitted. All the freighters report entire satisfaction at the treated sites. The pilgrim transport reports " all clear " after three voyages and the troop transport reports the same news.

Of the three formulations tested, the orders of merit are as follows: (c), (a), (b).

So much for the dramatic initial successes. What of the technique and hazards, if any? The earliest tests were done with the clean paint brush and applied to all surfaces including the deckhead and lockers. In confined spaces without adequate ventilation, natural or mechanical, lachrymatory effects and a certain amount of respiratory hazard was experienced. By using a respirator on all subsequent operations, no further objectionable features were encountered. In the trials of larger dimensions, an electric compressor unit and pistol-type sprayers made the work relatively easy and it was possible to treat spaces, otherwise inaccessible by the brush method, where cockroaches were known to live most of their life and lay their egg capsules. The spraying method has several advantages, among which the aforementioned is by no means the least; the average area covered is estimated to be seventy-five square yards per gallon.

It is gratifying to learn that by a suitable process of lacquer dilution, the unpleasant vapour emanating from the coating can be considerably reduced without impairing the efficiency of the formulation, and efforts are being made to raise the " flash point " as a counter measure against the risk of fire.

The overall results of these preliminary investigations and field tests aboard ship have been most satisfactory and the process may prove to be the prelude to an improved standardised insecticidal treatment for ships and other forms of transport.

Finally, a certain amount of skill and intelligence is required of the operators to obtain efficient results, and to this end only properly trained personnel should be engaged to carry out the treatment. Furthermore, the surface will only remain effective while the crystalline " bloom " remains exposed, therefore, any fresh painting of a lacquered surface will render it useless and necessitate another coating of lacquer.

Conclusions. The ideal pesticides are those which are specific only to the pests concerned. That is the ultimate objective. In the meantime, this port health staff has striven to find the best weapons to exterminate promptly and effectively the persistent infestations of rodents and cockroaches. No claims are suggested that the substances mentioned are " the last word," but each has proved worthy of full consideration in any pest control.

"1080" is a dangerous poison and should be used by trained personnel only. This port health authority does not use it exclusively, but it is extensively used with great success. If the operational instructions are obeyed, the results indicate that the prejudice and fear of " 1080 " as a rodenticide is an exaggeration under such conditions. The high initial kill obtained for a properly conducted overnight operation is very useful in port installations and, in the wider field, could be the prelude to a longer term warfarin operation. Ships have been effectively deratted overnight.

Insecticidal Lacquer should only be applied by competent personnel. Treatments for cockroaches have proved effective for longer than twelve months when used aboard ships and it is confidently expected that the residual effect will remain for at least eighteen months. Experimental results indicate that ships could be most effectively treated during periodic overhauls in the dockyard, when insect harbourages can be thoroughly exposed.

Containers for Inland Transport

Recommendations of Economic Commission for Europe

During the eleventh session of the Inland Transport Committee (Economic Commission for Europe), recently held at the European Office of the United Nations in Geneva, a number of resolutions aimed at improving the structure and operation of European transport were adopted. These included three resolutions on container traffic, their object being to promote the use of such transport equipment in international trade.

The report as a whole was adopted by the Committee for submission to the Economic Commission for Europe at its ninth session opening at Geneva on March 9th. The Committee gave a great deal of time to discussion of the question of co-ordination of transport (rail, road and inland waterways). It is common knowledge that in most European countries there is a movement of opinion in favour of measures to ensure the rational organisation of all transport facilities. In the opinion of a large number of the delegations attending the session, the present state of affairs is conducive to waste of effort and resources. The problems arising in connection with co-ordination have been defined and the next step is to consider what practical steps can be taken to solve these problems.

To facilitate a greater use of containers the Committee adopted:

(1) a resolution laying down the technical conditions (structure, closing systems, etc.) to be fulfilled by containers accepted for international transport under Customs seal.
(2) a resolution laying down the conditions for the temporary duty-free admission of containers.

By a " container " is meant an article of transport equipment (lift-van, movable tank or other similar structure):

(a) of a permanent character and accordingly strong enough to be suitable for repeated use;
(b) specially designed to facilitate the carriage of goods, by one or more modes of transport, without intermediate reloading;
(c) fitted with devices permitting its ready handling, particularly its transfer from one mode of transport to another; and
(d) so designed as to be easy to fill and empty.

The word " container " includes neither vehicles nor conventional packing and, in principle, applies only to articles having an internal volume of one cubic metre or more.

(3) a resolution by which the Working Party (containers) is requested to study the problems connected with equipment other than containers which can be used for combined transport (door-to-door) without transfer of the goods it contains (road/rail trailers, wagon-carrying trailers, pallets, etc.).

Harbour Wind Screen

A Massive Construction at Havre for Large Vessels *

The Gale and Mishap.

The Central Mole in the Theophile Ducrocq basin, Havre, lies north and parallel to the Charles Laroche breakwater in the Seine estuary. This mole was devoid of any substantial buildings which may have screened the fitting-out berth for large liners. In 1939 the moorings were considerably strengthened to accommodate the *Normandie* but some were damaged during the war. However, at the time of accident here related they comprised A, dolphin of reinforced concrete; B and C, reinforced concrete dolphins 12.0 x 10.0 metres, each computed to withstand pulls of 1,000 tons; D, a sunken "Mulberry" caisson fitted with fendering; E, a reinforced concrete dolphin (Fig. 1) and bollards on the mole.

In the late summer of 1946 a liner of 50,000 N.R.T. placed out of commission for repair, was moored alongside, bow to the westward, in charge of a skeleton crew, dependent on shore services for all power and light. On December 8th, 1946, a violent gale sprang up. The centre of depression (727 mm.) moved north-east at 15/20 km./hour and passed near to Havre at 22 hours on December 8th. The captain of a tanker at the petrol berth recorded in his log "Wind south/south-west, 11 Beaufort" at 21.15, and threequarters of an hour later it veered to west/south-west of equal force. Shortly after midnight it dropped to Force 10 and veered to west/north-west and diminished rapidly. Observations were confirmed at the meteorological station at Cape Antifer, where periodic gusts of up to 108 miles per hour intensity were registered. Due to the regional depression and the on-shore wind the high water level reached 2-ft. 6-in. above normal and remained so for two hours.

It will be appreciated that with this exceptional tide level this large liner without ballast and with high freeboard, and the absence of any structural protection on the mole presented an extensive surface to the violence of the gale. Events happened suddenly. According to the Officer commanding, the moorings were heavily strained and at 21.15 hours a flash of sparks was seen on the port bow, all the moorings appeared to have parted together and the vessel swung out northwards across the basin towards the ruins of the Joannes Courvert quay, where the vessel grounded. The engineers aboard immediately closed all watertight doors. Three minutes only had elapsed. Fortunately at 01.30 hours December 9th the vessel slid off the debris of the wall and appeared only slightly damaged. However, although all safety precautions aboard to contain leaks had been taken water poured into the vessel and spread through the gaps in bulkheads, etc., where repairs were in progress.

The vessel began to list to port. By 06.00 hours she listed 6° and again grounded. At 10.00 hours the list increased to 47° and it seemed she would turn over but the rising tide re-entered the vessel. She then gradually righted herself and in 20 minutes settled down into the mud bottom of the basin.

The Character of the Moorings.

The subsequent enquiry into the causes of the calamity brought forth the following particulars regarding the disposition and nature of the moorings (Fig. 1).

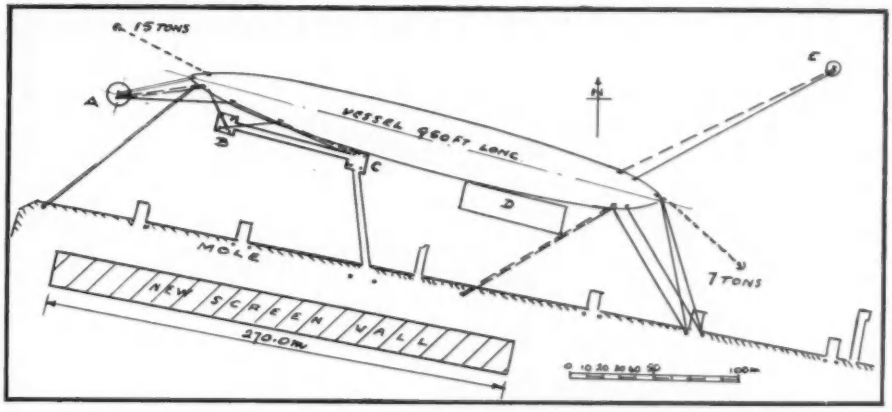


Fig. 1.

Forward.

Starboard anchor of 15 tons about 250-ft. ahead of bow: the port anchor being plumb to bed and had no part in the moorings.

To the west dolphin A, two 11-in ropes; one 5-in. steel wire rope, doubled; one 9½-in. towing hawser including 30 m. of 2⅜-in. chain.

To the mole end bollard, one 11-in. rope, and one 9½-in. steel wire on short length of 2⅜-in. chain.

To dolphin B, one 9½-in. towing hawser of galvanised steel wire (breaking stress = 260 tons), one 5-in. steel wire rope trebled.

To dolphin C, one 7-in. hawser, and one 11-in. rope doubled.

Aft.

Borrowed anchor of seven tons to port about 50 metres astern.

Six lines to mole bollards, two 7-in. steel wires raking forward, two steel wires 6 and 6½-in. each with 25 m. of 2⅜-in. chain and two 11-in. ropes to aftermost bollards.

On starboard side one 3½-in. wire rope and one 11-in rope to dolphin E.

Appreciating that the stern anchor was added to restrain the fore and aft ranging of the vessel already experienced, one could not in fairness fault the disposition of the stern moorings. The lengths balance and the disposition and character are in conformity with good practice to withstand beam wind pressure.

One cannot say the same, however, about the bow moorings; disposition, disparity of lengths and unbalanced material character show a serious lack of seamanlike efficiency upon which the maritime commission of enquiry commented adversely. In the first place the ropes to dolphin A were too oblique, and the short springs to the dolphin B were too heavy; secondly, there were not sufficient lines abeam to the mole bollards, and thirdly it was injudicious to bend back the strong hawser spring round the fairlead roller.

The Force of the Wind.

The effective surface of vessel hull and superstructure to beam wind was 5,250 sq. m. (56,400 sq. ft.) and the total wind pressure was later computed to be about 600 tons at the time of mishap. Several of the links of the aft 2⅜-in. anchor (7 tons) chain rated at a rupture stress of 140 tons showed permanent deformation. The chain test proof load was 100 tons therefore it could be reasonably assumed that the tension experienced was between 100/140 tons, say, 120 tons. The bow anchor (15 tons) was dragged considerably through the bed and the sunken hulks lying thereon. Neither anchor nor chain showed signs of strain. This is not surprising as this 4¼-in. anchor chain had a normal working pull of 135 tons, a chain test proof load of 280 tons and a rupture stress of 350 tons. It would therefore be reasonable to assume that this anchor sustained a pull of 200/300 tons.

The Enquiry.

As a result of the findings and recommendations of the Commission of Enquiry and the further representations of the ship repairers about the difficulties (indeed impossibilities was the expression used) of providing moorings of adequate resistance to defeat the power that the wind could exercise on large vessels in this berth the problem was resolved into the provision of some effective screen constructed on the Central Mole. The first reception of this proposal was not encouraging. It was argued against it, that the gap of 330-ft. width between the rear of the proposed screen and the berth would prevent the quietness desired. The decision was eventually taken to examine the efficacy of the proposal by means of tests on reduced models of various shapes at the Institute Aerotechnic at Saint Cyr by Professor Toussaint.

* "L'amenagement du post de reparation a flot pour grand navires dans le port du Havre," by Pierre D. Cot, Ingenieur en chef des Ports et Chaussees, abridged paper from "Travaux," September, 1953.

Harbour Wind Screen—continued

Reduced Model Experiments.

The results of these researches were of great value: several factors of importance were verified:

(a) the lee wake was found to be practically constant for all velocities of wind and the efforts on objects placed in the lee shadow was found to vary as the square of the velocity;

(b) Eddies, however, were apparent and the receiver was shaken by gusts, which in reality would be dangerous to a moored vessel. This phenomenon of eddy formation in the projected lee in all liquids is well known, the theoretical zone of quietescence is dragged circumferentially into gyratory motion by the passing main stream. The experiments showed that this effect could be reduced by feeding the lee through openings in the screen allowing direct passage of the mobile air stream;

(c) The obliquity of a vessel to the direction of the wind was shown to lead to a rapid diminution of the normal drag. When it reached 45° the drag was three to four times less than when it was abeam, but, at the same time, there is a longitudinal force parallel to the axis of the vessel and a turning couple which tends to swing the vessel into the wind. The existence of the force parallel to the centre line of the vessel explains the longitudinal movements. By reason of the inequalities of the wind the vessel reacts under the restraint of the moorings and oscillates back and forth, much as happens in harbours subject to ranging (or seiching). These forces cannot be neglected. For a large vessel they may reach up to 100 tons.

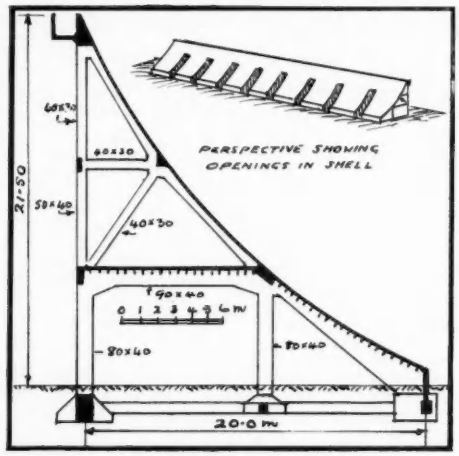


Fig. 2.

In the particular case under consideration it has to be admitted that the turning couple is greater for a vessel protected by a screen than it would be without, by reason of the fact that the lee shadow may uncover a certain length of the vessel which is therefore subjected to the direct wind whilst the remainder of the length is screened, resulting in an added load on the moorings in the open quarter.

The New Wind Screen Wall.

After due consideration of the most favourable profile and proportions of the screen as found by the reduced model tests the design work was put in hand. The ground area covered by the structure was 270 metres long by 22.0 m. wide. It had the form of a part cylindrical shell with radius of 40 m. Supported with axis horizontal on a framework of reinforced concrete (Fig. 2). The shell was 3-in. thick and frames were spaced at 6.55 m. (21.5-ft.). There were eight openings in this shell 7.50 m. wide (24.5-ft.) and extending to the triangular beam at second horizontal strut level. The lower portion with portal frame was covered in entirely to serve as stores, etc. The design load was fixed at average wind pressure of 22 pounds per square foot which at a factor of safety of 10 imposed a maximum ground pressure on the foundation of fine sand of 1.1 tons per square foot. The structure was completed in seven months from commencement of drawing office studies. After six years from completion it has given much satisfaction. It was found, however, that the thin shell under the variations of temperature showed considerable cracking and want of watertightness. Therefore in 1951 a layer 6 mm. thick of a bituminous product with asbestos fibre " Asseco " was spread over the whole surface after the cracks had been stopped. It was then painted with aluminium paint.

The shore moorings have also been considerable strengthened.

The contractors were Enterprises Compenon-Bernard and the engineers Messrs. Pittoors, Journal and Hubert, under the direction of the Engineer-in-Chief, Mr. Pierre D. Cot, and the Port Director, Mr. Pierre Callet.

R. R. M.

Wool Traffic at Southampton Docks

An Important Import and Transhipment Cargo

Southampton is Britain's principal port for the importation and transhipment of South African wool and in an average year over a quarter-of-a-million bales are received from the Union in the ships of the Union-Castle Line, which maintain a weekly service between the Cape and Southampton Docks. Small quantities are also occasionally received from South America by ships of the Royal Mail Line.

Wool is received all the year round but the heaviest period is from October to January, coincident with the shearing season in South Africa, when a single shipment may comprise as many of twelve thousand bales.

The bales vary in weight, from 215 to 300 lbs., according to whether the wool is greasy or scoured. The former is wool in its natural state but scoured wool has had the natural lanoline content removed by a special process. " Wool tops " is the name given to wool which has been partially processed. All bales are press-packed to conserve shipping space and are metal banded.

The bulk of the wool for United Kingdom consumption is despatched by rail from the docks to the woollen, worsted, carpet and rug industries centred around Bradford, and smaller quantities are sent to London and the West Country Large numbers of bales are also transhipped to the Continent from Southampton by steamers of the Dundee Perth and London Shipping Company, who ship to Dunkirk, and the General Steam Navigation Company, who operate from Southampton to Antwerp, Rotterdam, Hamburg, Bremen, Bordeaux and Genoa, the wool usually being loaded in these steamers at a berth immediately adjacent to the Union-Castle inward liner. Wool is also sent to the Continent via British Railways' Dover-Dunkirk train ferry, being loaded into train ferry wagons at the Docks which are routed via London.

The ships of the Union-Castle Line employed on the weekly service from South Africa berth alternately at the New Docks (berths 103/4) and at the Old Docks (berths 35/6). At the latter berths the sheds are double-storied, the bales being landed on to the upper platform and trucked into the large storage area on the first floor, where they are stacked, sorted to mark, examined by Customs and delivered according to merchants' instructions. The bales are transferred to the ground floor for loading to rail by 1-ton overhead travelling cranes and there are also overhead " Goliath " cranes at the back of the sheds for loading to the outside rail track.

At the New Docks the sheds are single-storied, but in the new double-storey terminal now being built at 102 berth, principally for use by ships of the Union-Castle Line on the South African service, cargo will be dealt with at first floor level by the latest mechanical cargo handling equipment. The new Terminal, which it is anticipated will be in use by the summer of 1955, will enable the weekly inward and outward working of the Union-Castle liners to be concentrated at adjacent berths, the inward liner being dealt with at the western berth (102) and outward operations at berth 101.

It is of historical interest to reflect that wool was the basis of Southampton's prosperity in the Middle Ages, with the difference that then English wool was exported and a memorial of this can still be seen in the fourteenth century Wool House, opposite the entrance to the Royal Pier, where the bales of wool were stored, sampled and weighed before being shipped to the Continent. The family of the Earls of Warwick held the hereditary rights to the custody of the weigh beam, which was farmed out to the highest bidder. So far as Southampton is concerned, the wheel has turned full circle and where once English Wool was the staple export of the port it is now the import of wool that forms one of the principal trades of the docks.

The Handling of Export Cargoes

Comments by Port Authority, Stevedore and Shipping Line

The facilities provided by a port authority for the rapid loading and unloading of vessels and the receipt and distribution of cargoes; the methods of stevedore companies concerned with the handling and stowage of cargoes (with comment on multiple loads, and the description of goods on papers), and the experiences of a shipping company in relation to overseas conditions and packing errors by manufacturers, were the chief subjects dealt with under the title of " Handling of Export Cargoes " at a meeting of the Northern Area of the Institute of Packaging in Liverpool recently. The following are extracts from the observations made by the Team on the platform (consisting of Mr. W. E. Sutton, Mersey Docks and Harbour Board; Capt. R. F. Handley, Port of Liverpool Stevedore Co.; and Mr. W. R. Macrae, the Pacific Steam Navigation Co.):—

The Port Authority.

Mr. W. E. Sutton said the work of the Mersey Docks and Harbour Board was two-fold, for they had to provide everything that was necessary to ensure firstly, the safe arrival, harbourage, bunkering, etc., of vessels, and secondly, the rapid loading and discharging of their cargoes and its reception from and distribution to the hinterland. During the last war one-third of Liverpool's transit sheds and warehouses were completely destroyed by enemy action and another third badly damaged. Most of the damaged sheds had now been repaired and over two miles of new sheds were in use. In designing these sheds the advice of the Master Porters (who handled the cargoes) and the shipowners whose vessels used them) was sought and their ideas, wherever possible, incorporated in the final design. Where space was available, a quay margin of about 35-ft. accommodating 3- and 5-ton portal cranes and two lines of railway track had been provided. Shed widths were of the order of 120-ft. in two spans, with ample head room to enable full use to be made of modern mechanical equipment. In providing batteries of four 3-ton and one 5-ton cranes at each ship's length, the Board believed that they had achieved a balance which would give the maximum results having in mind the output from the ship's hold and the work in the transit shed.

Stevedores' Problems.

Captain R. F. Handley said that the Stevedore Companies gave every facility for the safe handling of goods into ships, and no effort or expense was spared to ensure that goods were stowed safely and properly. The shipper, however, also had to play his part and provide safe and secure packages. Although the shipper was concerned with expense, he had to appreciate that economies in packing costs could lead to unsafe packages.

It was not sufficient to mark a package " Do Not Tip " and then design a pack so that if it were tilted the contents would break out. The stevedore would do everything possible to avoid tilting, but circumstances could make this unavoidable. (e.g. cases of 35-ft. long rods or tubes having to enter a 30-ft. hatch). Breakage of cases and/or damage to goods likely to result from inefficient packaging could result in the shipment not going forward, or only in part.

The Stevedore aimed at giving cartons and frail goods top stowage, and placing valuable or pilferable goods in lock-ups in the ship. If, however, the goods did not arrive until, say, the last day of loading, it might be that lock-up storage was not available. Shipping Companies gave opening and closing dates for receipt of goods for a specific ship, but on a ship he had just loaded over a period of 10½ days, the following were the tonnages received for loading each day: 1st, 78; 2nd, 131; 3rd, 5; 4th, 211; 5th, 182; 6th, 304; 7th, 233; 8th, **703**; 9th, 211; 10th, **934**; and 11th, 217, despite advices to shippers' agents three weeks before commencement. Late arrivals could leave bales of cloth to be stowed with soda ash, or cartons of jam with machinery, and expensive precautions had to be taken using dunnage and chocking, etc., which could have been avoided with earlier arrival, and a better stowage arranged. There was a growing tendency to form multiple loads (i.e. washing machines formerly sent singly were now being packed in fours. This attempt to save space was not always economical because pilferage was just as possible, and, as stowage was usually far more difficult, the risk of breakage increased.

Papers accompanying goods always ought to give full details of contents. His firm had recently received a case marked " Hardware " without papers. As hardware is not considered a valuable cargo, it was stored on the quay before loading. The contents proved to be expensive cutlery—and half of it was missing on reaching destination. Correctly marked, or accompanied by papers giving full details, the case would have been placed in a locked store in the transit shed and in a lock-up aboard ship. Summarising, the speaker emphasised the need for safe packaging even at slightly increased cost, more care in the description of goods, and a great deal more consideration to early arrival at the quay.

Shipping Companies' Difficulties.

Mr. W. R. Macrae said the largest export outlets for British manufacturers were undoubtedly Empire ports. In the main these were reasonably equipped. His company shipped to the West Coast of South America, and ports here varied from those with wharf accommodation, and ports with wharf accommodation and swell or a wide range of tides, to ports where discharge was into lighters in mid-river or into lighters in the open roadstead. Handling out of the ship was in no way as efficient as in British ports, and where goods were consigned to inland destinations they had to undergo still further handling under primitive conditions. Improvements had been made, but it would be many years before overseas port facilities reached the standard of Europe.

Apart from these difficulties, the personnel of the docks were of a different race and had many diffierent ideas. He classified these under six headings: (1) Damage which could be caused by lack of experience in handling equipment. South American port labour would not admit they could not handle new trucks or other equipment. But one instance of damage to china in wood cases was caused by inexperienced labour using fork trucks; (2) Damage due to dilatory methods. Instances of earthenware and chocolate being damaged were due to remaining on quay for considerable lengths of time before collection; (3) Damage due to insufficient sense of personal responsibility. Some tiles exported to South America were extremely well packed indeed, but when tipped down some chutes in South America, considerable quantities were damaged; (4) Damage due to " Jackdaw " complex. When some drums of cement were being unloaded, one was damaged and the head came off. Inside, provided by the makers, was a small measuring cup of plastic. Later, it was found that all the drums had been broken open and the cups removed. This, in conjunction with the aforementioned dilatoriness, resulted in the cement being rock hard when collected; (5) Damage due to particularism. Sometimes, dock personnel developed grudges against particular countries. In one instance, a load of furniture for the Brazilian Embassy was tampered with and the upholstery ripped with a knife. Whilst it was nice to see cases marked " Made in Britain " manufacturers should not carry this too far; (6) Damage due to sheer ebullience. This led to lightweight cases being thrown from man to man. When, every now and again, one was dropped, the result to the contents was grievous.

The speaker concluded by observing that weight marking should be precise. When a package was examined by Customs and it was found that the actual weight was not the same as stated on the container, the case was usually opened for inventory. This meant that the case could be pilfered at a later date without anyone detecting that the case had been opened twice. Full information should be given regarding the marks on the cases and the documents. The shipping company could only control and care for cargo whilst it was in their physical possession. Once landed at an overseas port, all control disappeared.

Expanding Trade at Port of Nacala.

During the first six months of last year 75 vessels entered the new port of Nacala, Mozambique. Shipments amounted to 56,081 tons, while 136 passengers embarked and 2,162 landed. These figures compare with a total of 84 vessels, shipments of 67,763 tons, 163 passengers embarked and 2,813 landed during the whole of 1952. The port now has two warehouses, covering an area of 2,600 sq. metres, six cranes for loading and unloading lighters and one crane with a lift of 25 tons. Work is to begin shortly on a new berthing wharf.

New Iron Ore Berth at Birkenhead

Mechanical Handling by Transporters

(By a Special Correspondent)

A SPECIAL berth recently constructed on the north side of Bidston Dock, Birkenhead, will add considerably to Merseyside facilities for dealing with the increasing arrival of iron ore cargoes, and will materially assist the iron and steel industry of this country. Increased demands for iron ore owing to a vast programme of expansion at the Hawarden Bridge Steelworks of Messrs. John Summers & Sons, Ltd., led to the Mersey Docks and Harbour Board leasing a quay and land at Bidston Dock for their new installation.

The new berth is approximately 1,000-ft. long and can accommodate two ships each of 8,000 to 10,000 tons deadweight capacity, and will be equipped with two transporters at the outset and by a further two transporters if the importation of iron ore continues to increase.

All work of a civil engineering nature, with the exception of the connection to the main railway line and certain minor items, has been the responsibility of the Mersey Docks and Harbour Board who carried it out by direct labour under the direction of the Engineer-in-Chief to the Board. The work involved in the construction of the berth included:—

(1) The provision of foundations to carry the heavy loads imposed by the transporters.
(2) The widening of the existing quay to accommodate additional railway tracks.
(3) The construction of railway sidings and roadways.
(4) The construction of workshop, offices and sub-station.

Engineering Details of New Berth.

The Bidston Dock was built in 1933 and the depth of water was sufficient for ships with a draught of 27 or 28-ft. The dock wall was constructed of mass concrete founded generally on timber piles, and behind the wall was a reinforced concrete decking about 30-ft. wide carrying crane and rail tracks. The adjacent ground was undeveloped and had been used mainly for timber storage and the tipping of materials from buildings demolished during the last war.

Trial borings were taken at various points at the back of the dock wall to ascertain the nature of the ground, and calculations were made to determine the influence of the transporters and ore dump loading on the stability of the wall with normal water level in the dock and also in the case of a sudden draw-down leading to complete emptying of the dock, a condition which though possible is very remote.

The results of these investigations showed that it was advisable to support the back legs of the transporters on a foundation resting on two rows of strut piles cutting through any potentially dangerous slip surface. It was found necessary, however, not to drive the piles too deeply so that their toes should be kept as far as possible from the poor ground found at about 70 to 80-ft. below quay level. It was also found desirable to restrict the amount of ore to be landed in the dump to the rear of the transporters.

The nature of the ground behind the dock wall varied considerably, the first 50 to 70-ft. below quay level consisting of a thick bed of soft clay and then a thick bed of stiff brown clay. Below this were layers of sand, clay and slurry, while rock was found at depths varying from 90 to 115-ft. Consideration had to be given to the total weight of each transporter with 200 tons of ore in the hoppers which amounted to 780 tons, the load on each corner—304 tons, being transmitted to the rails by two 4-wheel bogies fitted with compensating beams, i.e. 38 tons per wheel.

The foundation for the track nearest the quay edge was formed by constructing a continuous concrete counterfort on the steps at the back of the dock wall. In order to carry out this work the existing concrete decking was broken away leaving a gap about 7-ft. 6-in. wide for the full length of the quay. The existing main beams and certain portions of the slab reinforcement were, however, left in place to act as transverse reinforcement in the new foundation. Steel sheeting was then driven down behind the dock wall until the required step in the wall was reached—about 24-ft. below quay level—and the ground excavated, struts from the dock wall being provided where necessary.

Pumping arrangements were made to deal with water seeping from the dock and adjacent ground. The foundations were then constructed using a 1 : 3 : 6, and 1 : 2 : 4 mix of concrete, suitable reinforcement being provided to act as vertical ties. At the top of the foundation, a chase 4-ft. wide by 4-ft. 6-in. deep was provided for final grouting up of the transporter rails, $\frac{3}{4}$-in. diameter bars being left projecting to anchor the concrete.

Each set of rails for the transporter consist of two 112 lb. per yard standard flat bottom rails at 2-ft. centre, the rails having 12-in. x $\frac{5}{8}$-in. bearing plates to disperse the load, and 4-in. x 3-in. x $\frac{1}{2}$-in. kerb angles to provide the grooves for the flanges of the wheels; 4-in. x 4-in. x $\frac{5}{8}$-in. angles at about 5-ft. centres were used to tie the rails together, and $\frac{5}{8}$-in. diameter bars welded to the underside of the bearing plates anchored the rails in the concrete. At about 80-ft. centres special cross-members were welded to the rails to form a socket for the locking bars that can be lowered to prevent longitudinal movement of the transporter along the quay. The rails were fabricated to requirements and delivered to the site in lengths of 40-ft. After accurately lining up, the rail bearers and kerb angles were welded together to form a continuous length of track 950-ft. long, and grouted up using 12-in. of a 1 : 1 : 2 mix of concrete.

In order to construct the foundation for supporting the inner legs of the transporter, the ground at the back of the existing decking was first excavated to a suitable depth, the spoil being used to raise the level of the ground in the vicinity of the railway sidings. Two rows of Appleby-Frodingham No. 3 Section sheet piling, manufactured from copper-bearing steel, were then driven into the bed of brown clay until the required resistance was obtained. The piles were 50-ft. long, the rows 5-ft. 5-in. apart, and they were driven in pairs using a B.S.P. No. 7b single-acting hammer mounted on a travelling frame. At intervals of 13-ft. 1$\frac{1}{2}$-in.—a multiple of the section of pilings—diaphragms of similar sheet piling were driven to provide additional safeguard against settlement. The tops of the piles were burnt off to the required heights, 9-in. x 3-in. rolled steel channels bolted to the sides, and 15-in. x $\frac{3}{4}$-in. steel plates attached to form capping plates.

Reinforcement for the foundation consisted of $\frac{7}{8}$-in. diameter bars a 2-ft. centres in the bottom and 1-ft. centres in the top, all in a transverse direction, and some longitudinal bars, $\frac{3}{4}$-in. diameter bars were also provided to anchor the grouting-up concrete under the rails and, in addition, groups of bars encased in concrete were used to tie the foundation back to the existing decking at suitable intervals. After shuttering had been placed in position the foundation block 9-ft. wide by 8-ft. deep was poured using a 1 : 2 : 4 mix of concrete and leaving a chase for the rails similar to that provided in the dockside foundation.

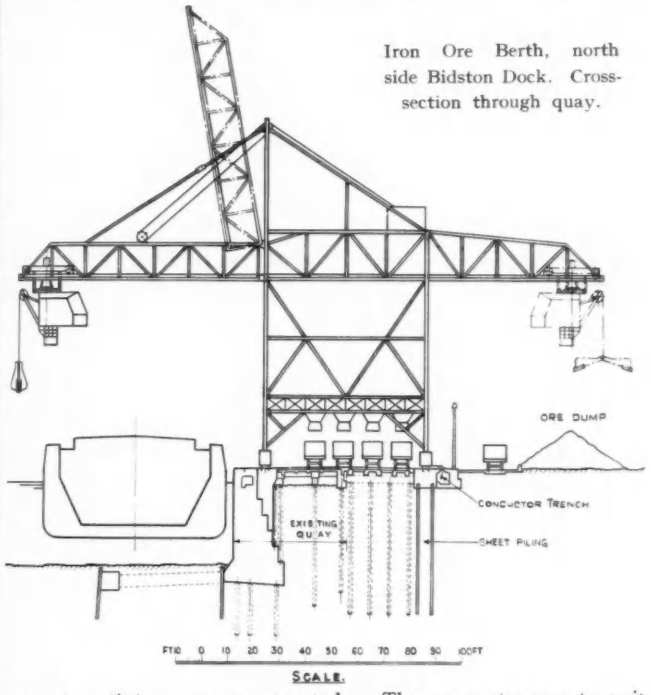
A feature of the transporters was the method adopted to provide a suitable connection for electric supply. If the conductors had been overhead they would have been liable to damage: they were therefore placed in an underground trench. This was constructed at the same time as the inner foundation block. Owing to tidal conditions in the dock, and the run-off of rainwater from the adjacent ground, it was necessary to keep the floor of the trench as high as possible, and because of this restriction only 5-ft. headroom could be provided. At the top of the trench a continuous slot 10$\frac{1}{2}$-in. wide allows the collector arm on the transporter to pass through, the slot being covered by a loose flexible steel plate which can be lifted locally when the transporter is moved along the quay.

Between the inner transporter track and ore dump a reinforced service roadway was constructed, the roadway slab being 8-in. thick except in way of the rail track where it is 18-in. thick. The con-

New Iron Ore Berth at Birkenhead—continued

crete was laid on a hardcore base and reinforced with steel fabric in the bottom only. The usual drainage facilities were provided and a concrete dwarf wall 2-ft. high was built at the side adjoining the ore dump to prevent spillage of ore into the roadway.

At the back of the existing quay new decking was constructed to accommodate three additional sets of rail tracks. This consisted of pre-cast concrete units resting on *in situ* main beams, supported by 15-in. octagonal concrete piles 55-ft. long. Four piles were used for each of the main beams which were spaced at 12-ft. 6-in. centres —the spacing of the main beams underneath the existing decking. The maximum load on the piles was estimated to be 68 tons, and the piles were driven until the required resistance was obtained. After stripping the pile heads the main beams, 3-ft. deep by 2-ft. wide, were cast on top, suitable reinforcement being provided to take the load from the concrete units supporting the rail tracks. At the same time earthenware pipes were laid for drainage, and the transverse beams connecting the existing decking to the inner trans-



Iron Ore Berth, north side Bidston Dock. Cross-section through quay.

porter foundation were constructed. The pre-cast concrete units supporting two rails are generally of an inverted "U" shape with the slab portion between rails 10½-in. deep and the edge beams underneath the rails 1-ft. 6-in. wide by 2-ft. 6-in. deep. No special arrangements were made at cross-overs as it was considered that a slab 10½-in. would be strong enough to take the loading, and also have the advantage of allowing for re-positioning of cross-overs should the necessity arise. After laying the units on the main beams the space between the units was fitted with earth and a concrete slab cast *in situ* to form a continuous width of decking.

At the western end of the quay the tracks join the sidings which have standage facilities for 344 wagons. These sidings in turn connect with two tracks which form exchange lines with the main rail service outside the dock area.

The work was carried out in accordance with current railway practice, but in order to give ample working room for shunters and to simplify the construction of the connections at the end of the tracks, the centre of adjacent tracks was made 22-ft. instead of the smaller distance generally adopted for sidings.

The Travelling Transporters.

The main contractors for the travelling transporters were Messrs. Jos. Booth & Bros., who were instructed by Messrs. Rea, Ltd., to whom the quay and land has been leased by the Mersey Docks and Harbour Board.

The first two transporters, which are electrically operated, each have a capacity of about 350 tons per hour and embody a number of special features. Their main requirements are to unload from the ship alongside into hoppers between the legs. They are, however, also capable of performing subsidiary functions which include filling wagons on any one of four lines of railway track which run between the legs. Hoppers incorporated in the legs have a storage capacity of 200 tons of ore. The control of the discharge of ore to the wagons is regulated by Sherwin feeds making the wagon-filling operation independent of the unloading of the ship. The transporters can also discharge overside from the hold of the ship to barges alongside: from hold to stock pile in the rear of the quay: and can reclaim from the stock pile to load wagons. Hoisting, traversing, and travelling are under the control of an operator who is accommodated in a cabin below the machinery house. The booms of the transporters can be raised to clear the masts and rigging of the ships.

The overall width of each transporter has been kept to a minimum, viz. 52-ft., which allows of two transporters working simultaneously at adjacent hatchways. The main trolleys of the transporters are fitted with a short jib capable of revolving so that when two transporters are working close together cargo can be discharged without excessive trimming. Slewing enables the grab to work underneath the hatch coamings. The grab, a scraper type, has a spread of 22-ft. and holds six tons of ore. The range of the lift is 85-ft., which gives a maximum height if 47-ft. above, and 38-ft. below quay level. The hoisting speed is 250-ft. per minute and the traversing speed is 500-ft. per minute. Four hoist motors give a total of 240 h.p. and the two traversing motors have a total of 100 h.p. The transporter is mounted on twin rails at 62-ft. centre. In all there are 32 wheels mounted on eight four-wheeled bogies.

The first of these two transporters which has been brought into use has an unloaded weight of 600 tons and took two years to complete, 15 months being occupied by design and building, and nine months by erection. The second transporter is now in course of erection and should be in operation during the year. When the two are operating they should be capable of handling approximately 850,000 tons of ore per annum. Ultimately it is estimated that 1,500,000 tons of ore will be handled annually.

Ancillary work included two tandem weighing machines, workshops for maintenance of the diesel shunting locomotives, and electricity sub-station, offices and facilities for workmen. The quay and roadway is illuminated by high pressure mercury vapour fluorescent lamps set at intervals of 75-ft. alongside the roadway. Work on the construction of the berth was commenced on site in June, 1950, and was completed in December, 1953. The cost of the scheme, excluding the transporters and associated electrical equipment amounted to approximately £450,000.

Correspondence

To the Editor of *The Dock and Harbour Authority.*

London County Council Evidence Before the Departmental Committee on Coastal Flooding

Dear Sir,—The Editorial comments in your December issue refer to the River Thames Barrage Scheme and to the Council's suggestion for further investigation of "the construction of breakwaters across the estuary." The essential difference between this scheme and the River Thames Barrage is that the breakwater scheme does not involve the impounding of the Thames as there would always be an opening in the breakwater which would provide the necessary facilities for shipping without locks, and would permit the Thames to ebb and flow, but abnormal flow would be checked sufficiently to prevent the serious effects of a surge.

I would like to add that this scheme has not been given detailed investigation by the Council and as it was considered that such a project was a matter for the deliberations of the Waverley Committee the proposal has been referred to that Committee.

Yours faithfully,

E. E. WOODS,
Chairman,
L.C.C. Rivers and
Drainage Committee.

The County Hall,
London, S.E.1.
18th January, 1954.

Simplified Construction of Jetties

Method to Reduce Shuttering Above Water

By CHARLES M. J. W. KOHLER, P.Eng. (Canada)
Consulting Civil Engineer.

Building concrete structures above water is always a difficult matter, because one lacks the possibility of supporting the shuttering on solid ground. The writer therefore modified the more or less standard design for two different types of jetties, built in the Far East. One is an oil jetty, to which design several jetties were built, the other one being a cargo jetty.

As the solid foundation level was at the end of both jetties about 130-ft. below high tide, precast round concrete piles were used of a length of 140-ft., having an outside diameter of 2-ft. 4-in. and a shell thickness of 4-in. These piles weighed 22 short tons and could carry 100 short tons each, by taking into consideration their buckling length.

Oil Jetty.

The main diversion from the standard design is, that the cross girders are precast, and the details of the jetty are shown in Fig. 1.

The construction was carried out as follows:—

After a pile was driven, the top was cut off, leaving the reinforcing steel protruding. The piles were then pulled or pushed into their proper positions by means of cables and turnbuckles or jacks, starting from the shore side. After this, the piles were filled over a length of 5-ft. with concrete, in which bars "c" were anchored.

On top of the piles were now cast blocks " a," using clamps around the piles to support the shuttering. Steel " b " from the piles, was embedded in these blocks. The levels of the tops of these blocks were very carefully established, on account of the slope in the jetty of 1 in 100, to enable the oil pipes to drain towards the manifold at the front side of the jetty, after oil pumping is completed. On top of the blocks " a," were now placed the precast concrete girders " d."

Along the approach, the girders " d " were, at one side, anchored to the piles by means of a block of concrete " e," cast around the girders, in which the bars " c " were placed. At the other side, beams " f " were cast between the girders, into which bars " g," protruding from the girders " d," and bars " h " placed through the blocks " a " and bars " c " anchored in the pile cores, were embedded.

At the head of the jetty, a similar procedure was followed. Where in the deck the openings for the manifolds are, the beams "k" had to be kept lower, to enable the oil pipes to pass over these beams

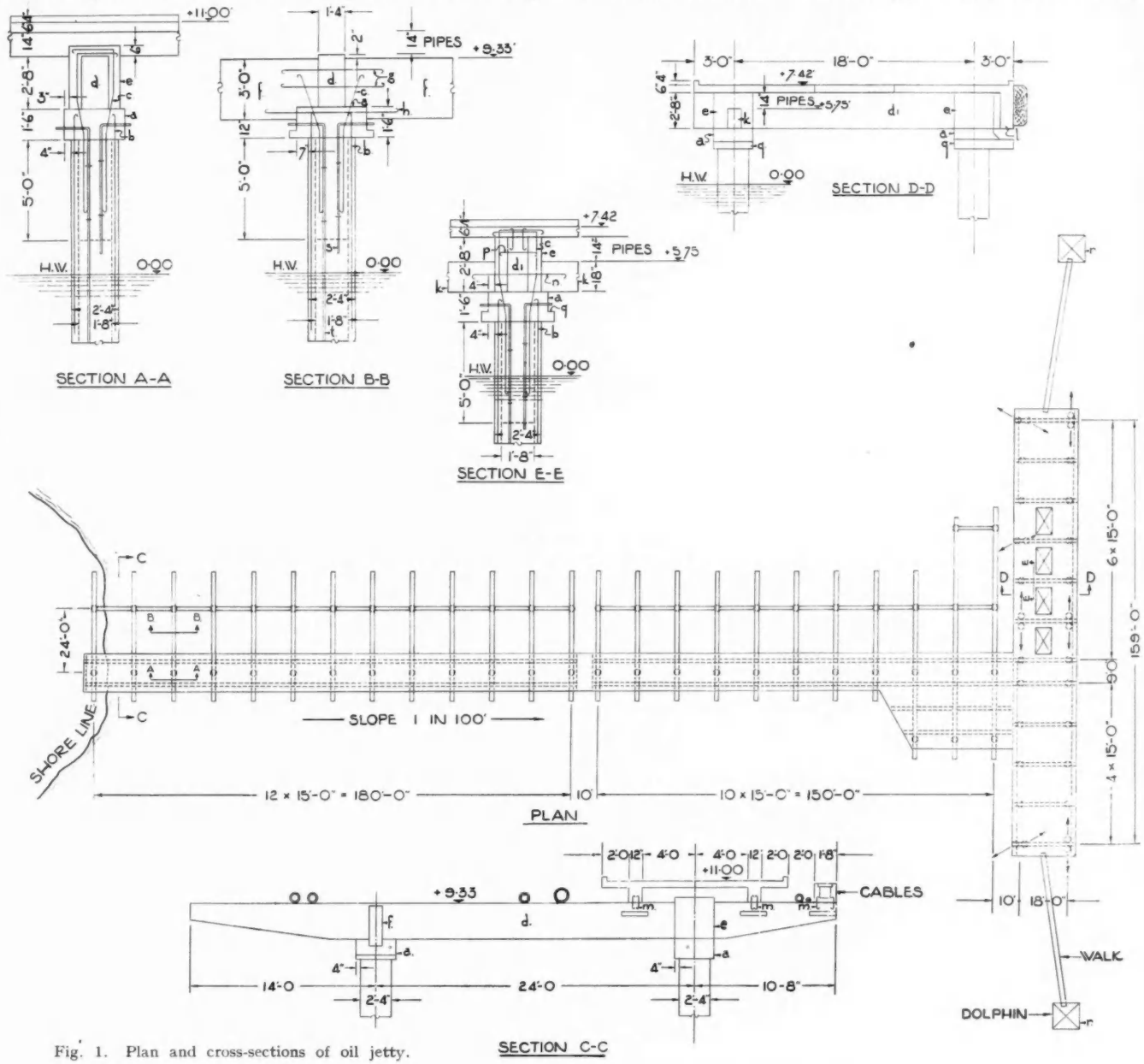


Fig. 1. Plan and cross-sections of oil jetty.

Simplified Construction of Jetties—continued

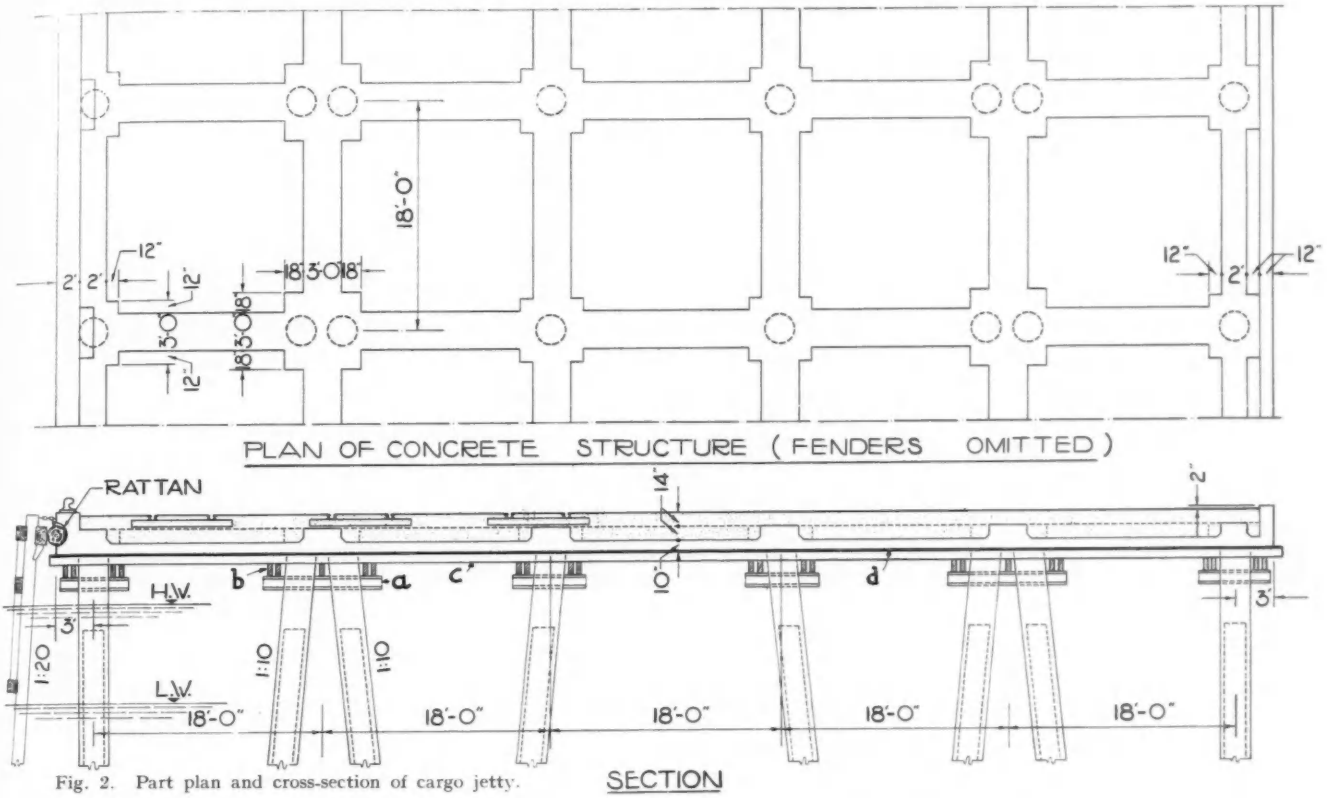


Fig. 2. Part plan and cross-section of cargo jetty.

to the manifolds. Bars " n," precast in girders " d_1," form the connection between the adjacent beams " k," whereas bars " p " are bonded into the concrete blocks " e." Where there are no openings for manifolds, the precast girders " d_1" are of the full height, similar to the beams " l " along the front.

For the longitudinal beams for the deck of the approach and for the cable duct, bars " m " protrude from the precast girders " d," and to support the shuttering for these beams, the cable duct and beams " t," concrete ledges were provided on girders " d."

The same arrangement was made for the beams along the front part of the jetty, the deck here being supported on top of ledges " q " by means of wooden joists resting on these ledges.

Tankers are not supposed to touch the front part of the jetty, but rest against dolphins " r," hence the absence of raking piles sloping towards the waterside.

Pipes for water, foamite, compressed air and steam are placed next to the cable duct, the oil pipes are at the opposite side, but the details of these services are omitted on the drawing, because each oil company has its own devices for them.

Another interesting feature is, that by keeping the long hollow piles filled with air, extra safety as regards carrying capacity of the piles, due to their buoyancy, is obtained. For every 10-ft. of submerged pile, the buoyancy is equal to 0.7 short tons, so that for a pile of 140-ft. length, with a submerged length of 130-ft., this amounts to nine short tons, or approximately by 9 per cent. extra carrying capacity.

To ensure that the inside of the pile remains free from water, two 1-in. diameter pipes were cast into the 5-ft. length of concrete filling the core, one " t " going down to the bottom of the pile, and the other one " s " to just below the 5-ft. of concrete, as shown on the drawing.

By blowing compressed air into the short pipe, water, which might have been accumulated in the pile, due to rain or waves, was ejected through the long pipe. After this, the long pipe was plugged and air pressure maintained inside the pile through pipes.

If a pile was leaking it was filled with a very watery cement grout through the long pipe and air pressure applied through the short pipe, after the long pipe was closed. After maintaining the pressure for about 10 minutes, the long pipe was opened, and the grout blown out.

Cargo Jetty.

Here another procedure is followed which also appreciably reduces the amount of carpentry work above water (see Fig. 2).

After the piles are driven, slots are cut in the shells at the top of the piles, in which wide flanged I beams " a," set at the correct level, are placed. These I beams support the wooden girders " b," carrying the joists " c," to which the wooden deck " d " is nailed. Afterwards the I beams are burned off close to the pile, sand-blasted and heavily coated with rock-asphalt applied hot.

The hollow piles in this jetty are also filled with concrete over a length of 5-ft.

The advantage of having a deck with a flat bottom surface is, that the work can proceed very quickly, and no adjusting or construction of shuttering for beams is required. As long as the boards are all equally wide and thick, it is only a matter of men, timber and nails.

The beams supporting the concrete deck are formed above the deck slab. One day the slab is poured and the following day the side shuttering of the beams is placed-supported on the slab, and the beams poured. The concrete is placed by means of 1 cu. yd. cocopans and chutes, the rails being supported on precast concrete blocks, which remain in the structure.

Over the slab a fill of very coarse sand is afterwards placed, the surface of the jetty being constructed as one would construct a road, with a bitumen topping. The advantage of this method is that repairs or relaying of railway tracks can be easily carried out, without having to demolish concrete.

In each panel five 2-in. holes are left through the concrete slab for drainage, over which 8-in. square pieces of galvanised wire mesh are placed, covered with 10-in. square pieces of galvanised iron plate.

The great advantage of this type of construction is the reduction in loss of timber due to cutting, easy stripping and speed of construction, all of which reduce the cost of the jetty. A large dead weight of a jetty is always an advantage, and allows the fendering

Simplified Construction of Jetties—continued

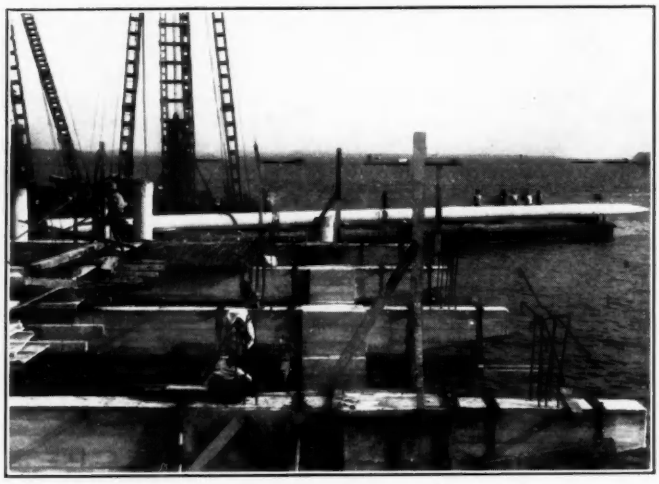


Fig. 3. Oil jetty in course of construction, showing pre-cast transverse beams and a 140-ft. hollow concrete pile.

to be reduced in strength. It has happened that an 8,700 tons steamer hit a jetty at an angle of 45° with a speed of half a knot. The damage was superficial and cost only £85 to repair. No cracks appeared in the concrete or in the piles, only the fendering and the front concrete beam were damaged.

Cargo Handling Symposium

Need for Vocational Training of Dockers

A symposium on training in cargo handling was held in Rotterdam on 25th January last under the auspices of the International Cargo Handling Co-ordination Association. The meeting was presided over by Dr. J. Ph. Backx, chairman of the Netherlands Committee of the Association, and was attended by delegates from Belgium, France, Germany, Holland and the United Kingdom.

The Employers' Point of View.

Mr. D. Rylandes Smith (Chairman of P. C. Smith Coggins, Ltd.) read a paper dealing with the need for education in the dock industry from the employers' point of view. He thought shipowners could congratulate themselves on the many international establishments that cater for the training of the seafaring fraternity. The nautical schools throughout the world set a great example by a very high standard. In addition, shipowners had admirable and adequate facilities for the recruitment and training of their sea-going personnel, and besides carrying cadets on their ships, some companies allocated ships on their regular runs for the special training of their young officers, cadets and sea-going personnel. Mr. Rylandes Smith went on to say, " Yet, in the dock industry itself we have little or no system of teaching or training from the top to the bottom, from the executive to the dock labourer. This case for the education of the labourer is so often countered by derision from the employers that it makes one seriously consider the need for us, the masters, to complete our education first. We must learn to tolerate and understand if we are to successfully bridge the human gulf between master and man.

" What of the men themselves? To teach a shipworker or longshoreman his job in a schoolroom we know is quite impossible. Like many other occupations the majority of the work must be learnt by experience the hard way and from one's fellow workers. The main requirements to educate a recruit to the dock industry are as follows: he must learn not only the principles of how to do the job. but why he is doing it. He must be injected with pride for his work and for the industry. He must learn the team spirit which is the basis of the gang system. He must develop a sense of responsibility and be taught to realise that the job of a docker is no menial task and that in any modern community the transport worker plays an essential part.

" We employers show with pride our modern plant, our mechanisation, our equipment; however, it is only in post-war years that any attempt has been made to teach the workers how to use them and to accept mechanisation as labour-aiding rather than labour-saving."

The Workers' Point of View.

A paper read by Mr. R. Laan, Jr., Secretary of the Transport Workers' Union, Rotterdam, dealt with " The Importance of Training for Dock Labour from the Workers' Point of View." Mr. Laan said that an aspect of casual labour was that members of the gangs continuously changed. This had an unfavourable influence on the work as the dockers could not get used to each other or feel any team spirit. He thought that as long as the organisation of the registration and employment of casual labour was solely in the hands of the employers, as was the case at Rotterdam and Amsterdam, the casual workers would not have a feeling that their interests were given reasonable consideration. In these circumstances it was no wonder that the men were extremely sensitive to the unfavourable aspects of mechanisation. In conclusion, Mr. Laan said that " with a view to the intricacy and greater responsibility of dock work we shall have to try and find a system through vocational training which will make the selection of supervisory personnel from the men already working with a particular company possible."

A Docker's Training School.

Mr. A. Peters, Head of the Welfare Department of the Shipping Federation (South), Rotterdam, read a paper on the Rotterdam Dockers' Training School. He gave the reasons as to why it had been deemed necessary to start vocational training in the Port of Rotterdam. "Among them," he said, " is the ever-increasing mechanisation which in the last few years had completely changed the character of dock labour. The port is growing to be a mechanised world. Technical equipment has made the former dock labourer a technical worker. Dock labourers have to readjust themselves to the rhythm of mechanisation and we can conclude that mechanisation brings about specialisation. This specialisation can only be achieved by vocational training. A second justification of vocational training for dock labour is the fact that young people all over the world are offered a training in all types of industry. The best young men choose industries where training is given and in the end the ports would be left only the second best and the failures in other professions." Vocational training was started in the Port of Rotterdam in 1949 for dock labourers (for work in the hold and alongside on the quays and in barges), warehousemen, trimmers, etc.: specialists such as fork-truck drivers, winch drivers and signalmen, tallymen; and for supervisory personnel such as foremen. etc. About 1,500 men had so far received training on board the ship " Veteraan " and in classrooms.

Following on Mr. Peters' paper the delegates visited the Dockers' Training School. Compulsory school ends in Holland at the age of 14 and dock labour is not permitted under the age of 18 years. Boys are therefore admitted from the age of 14½ years for an 18 months' course at the end of which they receive certificates as mates. They then become apprentices and at the end of this further training receive a certificate as journeymen. Military service then intervenes and on its completion former pupils are put to work under instructors for a refresher course. They are again introduced in the industry and new developments are explained to them. The school has a workshop well equipped for the repairing or making of minor dock equipment.

Training in Cargo Operations.

A paper on " Education and Training in Cargo Operations " was prepared by Mr. Charles L. Sauerbier (United States Merchant Marine Academy) and was presented by Mr. C. R. Woodley, Principal of the College of Production Technology, Ashford, Kent. Mr. Sauerbier said he knew of no training given to longshoremen in ports of the United States. The idea seemed to prevail that the work of the longshoreman is so basic that he needs only to observe his partner in the hold for a few hours and he will soon be brought up to the level of attainment of the others in his gang. This, Mr. Sauerbier thought, was a costly misconception. He went on to say: " This dependence upon a haphazard apprenticeship means of producing longshoremen is a heavy contributor to the waterfront's vast

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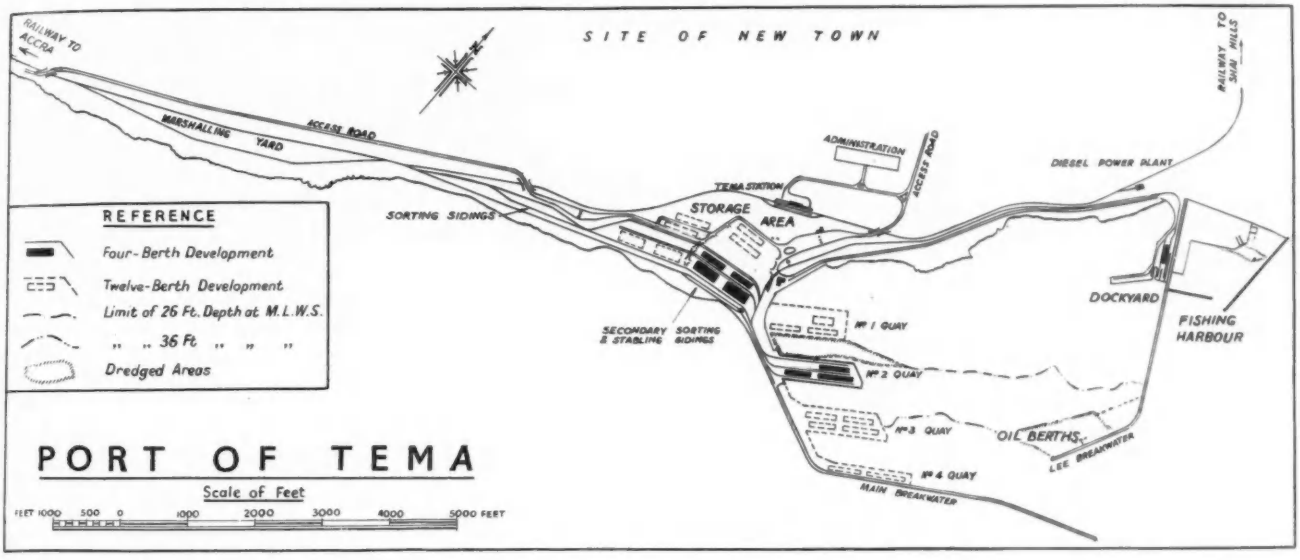
Port of Tema, Gold Coast

Outline of Proposed Construction Works

In their report to the Gold Coast Government in August, 1951, on the Volta River Project, the Consulting Engineers, Sir William Halcrow & Partners stated: " The immediate provision of a new deep water port is, in our view, essential to the future development of the Colony, irrespective of whether the power scheme is carried out or not."

Little time has been lost in implementing this recommendation for at the moment work is rapidly drawing to a close on the construction of 37 miles of 3-ft. 6-in. gauge railway and 13 miles of road designed for the purpose of giving access to the recommended harbour site at Tema some 17 miles east of Accra and to the quarry site which lies about 18 miles due north.



Tema is, at the present time, merely an African coastal village inhabited almost entirely by fishermen who land their dug-out canoes on the sandy beach nearby. The sea bed at this point falls away more steeply than at any other along the Gold Coast coast line and a depth of 42-ft. of water is found some 1,200 yards off-shore.

Under the present proposals the new harbour will enclose between two rubble breakwaters an area of approximately 310 acres having an entrance width of 870-ft. and a depth of 42-ft. at M.L.W.S.T.

The west or weather breakwater will be developed on the finger berth principle but initially only one four-berth finger is to be constructed. As and when required development will proceed to the stage of 12 deepwater cargo and three tanker berths with depths of water alongside varying from 26 to 40-ft.

Transit sheds 440-ft. in length and having a clear span of 85-ft. are to be erected at the berths whilst, near the root of the main breakwater, cocoa warehouses 400-ft. x 170-ft. are to be built adjoining approximately 120 acres of open storage and rough cargo areas.

Administrative buildings, offices and a new railway station are to be provided at the back of the harbour area where it has been planned the new township of Tema will be developed. The eastern area will be given over to industrial requirements and on the west extensive marshalling yards, sidings, workshops and so on are to be constructed to handle rail traffic serving the new harbour.

The general layout of the whole harbour as at present proposed is shown in the accompanying plan, and the possible future extensions are shown dotted.

At the eastern end of the enclosed foreshore it is intended to construct a small dockyard to deal with harbour craft and lighters. A slipway for 150 ton vessels and a dry dock 150-ft. x 20-ft. depth over the cill will be built, together with a fitting out quay 800-ft. in length offering 18-ft. of water at low water. In addition comprehensive workshop facilities will be installed and a new power station with a 1,300 k.w. output will be built to serve the initial needs of the port.

On the east side of the lee breakwater a small harbour will be provided to accommodate both the fishing fleet now operating from the Tema beaches, and the Scotch type trawlers it is proposed to build and use for the development of the fishing industry. Approximately 1,300-ft. of alongside berthing will be built as well as a slipway for small craft, boatbuilding yard, workshops and storehouses, whilst behind the berths kutch tanks, a market and administration buildings will eventually be erected.

Tenders for the provision of a four-berth harbour are being invited from a number of civil engineering contracting firms from England, France, Germany and Holland.

It is probable that work will commence on the site in the late summer and is expected to continue for about four or five years. Seagoing vessels will, it is hoped, be able to berth alongside in the harbour some two years or so after work has actually commenced.

The Consulting Engineers for the whole of the work on behalf of the Gold Coast Government are Sir William Halcrow & Partners, MM.I.C.E., Caxton Street, Westminster, London, S.W.1.

Cargo Handling Symposium

(concluded from previous page)

supply of error and strife." Mr. Sauerbier said that there were several ways in which a well organised and capably executed training programme for longshoremen will help any port. First, there was the spirit of the individual. An individual who is well trained and capable but who lacks the right spirit or enthusiasm for the job is less desirable than the man who is a little less capable but feels the job is good and has the urge to do the job right as a matter of personal pride in taking part in the affairs of the world. Then there was the question of improvement in the performance of the job which should be the basic objective of any training programme. There were also the questions of the promotion of safety and the raising of personal standards.

Need for Study in Cargo Handling.

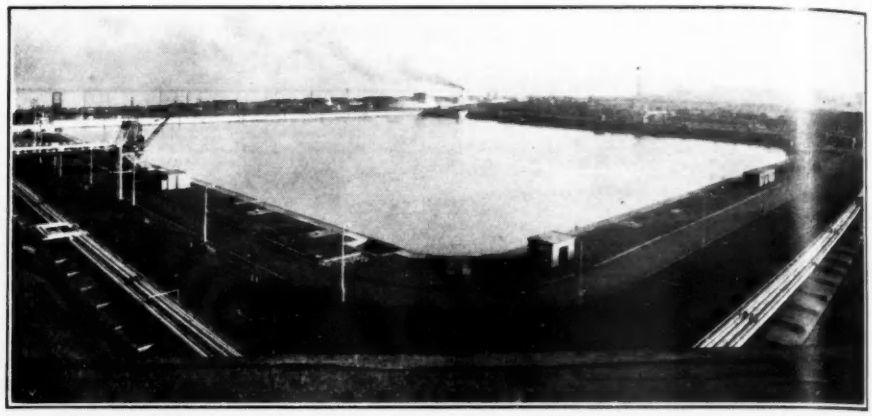
The last paper of the symposium was prepared by Mr. Woodley, who took as his theme the discussion of problems to be considered in formulating a course of study for cargo handling. Mr. Woodley stated that it was proposed to hold a short cargo handling course in London at the Royal Society of Arts on March 8th and 9th. The aim of this course was to deal with ways and means of increasing port efficiency by mechanical appliances and thus speed up the turn-round of ships.

Britain's Largest Oil Dock

The Queen Elizabeth II Dock Opened at Eastham

(By a Special Correspondent)

The completion of the largest dock construction work in 40 years was celebrated on January 19th, by the formal opening of the new Oil Dock at Eastham, Cheshire. This great enterprise is the Manchester Ship Canal Company's contribution to Britain's post-war policy of refining oil in this country. The rapid increase in oil imports since the war has led to a requirement for berthing the largest tankers and for enabling a quick turn-round. The new dock at Eastham is concerned exclusively with such tankers, and it has been placed strategically at the head of the Mersey Tideway and close to the many refineries and oil tank installations in the Stanlow area.



General view of the Queen Elizabeth II Dock, Eastham.

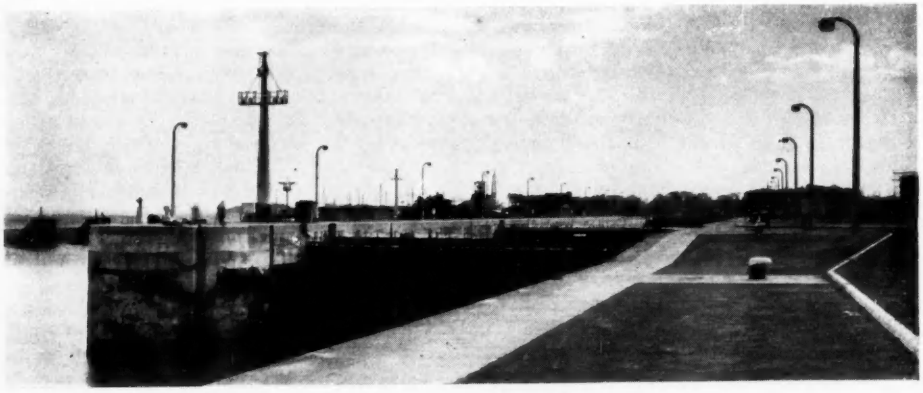
The dock is square, with four berths, and has an area of 18¾ acres, and a depth of 40-ft. The floor of the dock is natural sandstone while the walls are of concrete. Culverts connect the basin to the Ship Canal in order to maintain the water level without pumping. A recess has been provided at the north end of No. 2 Berth which will eventually become part of a link connecting the dock with the canal.

Excavation of the basin involved the removal of 3¼ million cubic yards of soil and soft sandstone, which was conveyed mechanically by conveyer belts to deposit sites in the locality. The top soil was set aside and used eventually to cover the spoil; the deposit sites were then regrassed and are now in use for grazing cattle.

The concrete used in the construction of walls amounted to ¾ million cubic yards. It was provided by a central mixing plant and distributed partly by pumping, and principally by means of conveyor belting. This is the first time the latter method has been used in Britain.

Berth Equipment.

The dimensions of the berths are as follows: No. 1 berth, 800-ft.; No. 2, 725-ft.; No. 3, 900-ft.; No. 4, 730-ft. Each is capable of accommodating a super-tanker. Berths 2, 3 and 4 are equipped with Companies pipes lines. All berths are equipped with ship to shore telephones connecting direct into the Ship Canal Company's dial system, a 12-in. ring main for fire fighting, a 9-in. fresh water main, and an 11,000 volt electric supply. There are also foam units at each berth, and the dock is permanently connected by telephone to the nearest fire brigades in Cheshire.



Day and night views of the entrance lock, showing lighting equipment.

" Oil Weirs."

Apart from the conventional safety precautions mentioned above, special precautions, the first of their kind in the world, have been taken to deal with spilt oil. The device consists of " oil weirs " which are grills set in the four corners of the dock area at surface level. If oil should spill from a tanker, a " reverse penstock " goes into action and sucks the surface mixture of oil and water into a system of chambers within the concrete walls of the dock. Here the oil can be skimmed off and collected, and it is possible to collect as much as 400 gallons in this way. Not only is fire hazard reduced; the reclaimed oil is cleaned and usable and can be pumped back into the lines.

Another safety precaution is the provision of drip trays installed where the flexible hoses from the ships connect with the pipe manifolds on shore. Any oil which escapes here is led by gravity into the oil weirs.

Duplicate electrical cables connect the dock to the grid system, to provide against

Britain's Largest Oil Dock—continued

View of one of the oil pipe gantries and hose-handling derrick cranes undergoing final tests.

power failure, and as a final precaution there are three stand-by diesel generators.

Hose Handling Equipment.

Three of the berths have been equipped with facilities for unloading oil; the fourth berth will be similarly equipped as and when it is required. The oil pipes are carried to the dockside on gantries; on each gantry there are two cranes which have been provided for handling the flexible hoses which form the link between ship and pipeline. By this means not less than four hose connections to each tanker can be made in a short time. The cranes were designed and supplied by the Yorkshire firm of John Smith (Keighley), Ltd. Similar cranes made by the same firm are used in the Middle East for transferring the oil from the land pipelines to the tankers.

Powerful Illumination.

Special attention has been given to the provision of adequate lighting both at the lock and at the berths. Electrical engineers of the Manchester Ship Canal Company have collaborated with the General Electric Company, Ltd. to devise a lighting system which does not interfere with navigation. The general lighting of the lock and dockside is by 250 watt blown cut-off lanterns mounted on 25-ft. columns. Where more powerful lighting is needed at the positions where the pipeline connections are handled and linked with the tankers, 400 watt Mercury floodlights have been mounted on 40-ft. columns. All these fittings have been adjusted so that there is no glare to interfere with tanker and tug navigation, while, in view of an airport nearby, similar precautions have been taken to prevent interference with aircraft.

Novel Features of Entrance Lock.

Readers will recall a technical description of the undertaking as a whole has already been published in the November, 1952, issue of this Journal. Since, however, the Queen Elizabeth II Dock is the first wet dock in Britain to open and close by means of sliding caissons, a short description of the main features will be of interest.

The entrance lock has an effective length of over 807-ft. and a width of 100-ft. The depth over the sill is 20-ft. below Liverpool Bay datum, giving a depth at the entrance of 5-ft. more than that of the dredged approach channel.

Before the design was finally settled research was undertaken at Manchester University by means of large scale models to determine the behaviour and optimum speeds of the largest tankers entering and leaving such a lock: at the same time investigations were made to determine a design and positioning of sluice openings calculated to produce a minimum of turbulence, and to ensure a uniform distribution of silt on the floor of the lock.

The lock is served by three sliding caissons, whereby locking chambers of 807, 607 and 177-ft. may be utilised. The caissons and operating machinery were supplied and installed by Vickers Armstrongs, Ltd., who also provided the hydraulic sluices. Both in the operation of the caissons and in the machinery for moving them methods new to dock machinery have been employed.

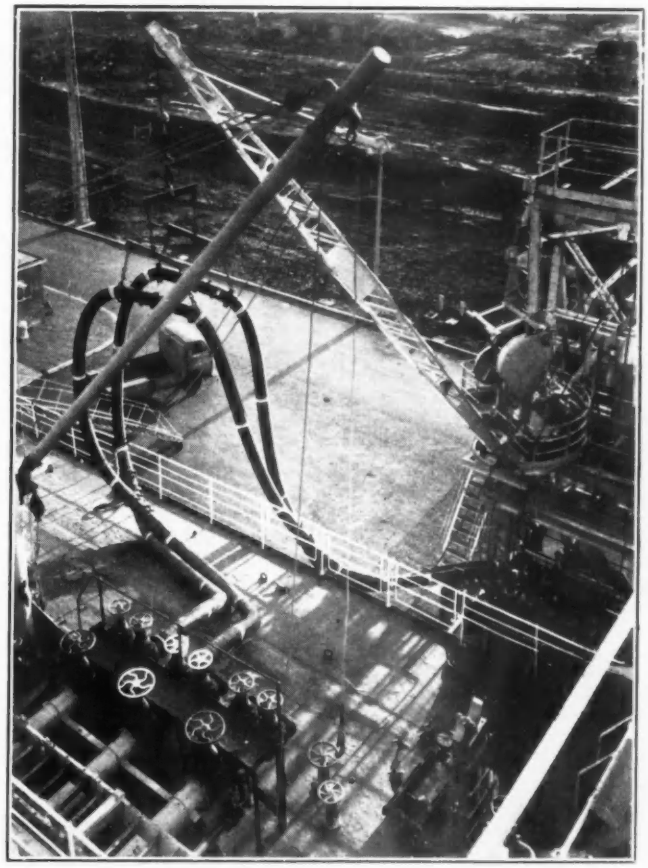
Caissons.

The caissons do not mitre like normal lock gates but slide sideways into recesses, or cambers, in the walls of the lock. Their ends are slightly tapered to facilitate initial installation and possible subsequent removal. The keels of the caissons are fitted with mild steel sole plates which slide on cast steel ways grouted into the bottom of the groves throughout the length of the sill and recess.

Each caisson is of all-welded steel construction, displacing some 1,700 tons, with a length of 106-ft., a width of 23-ft. and a depth of 57-ft. They are built to withstand a total water pressure of approximately 5,000 tons, which acts on the caisson when dry on one side.

The caissons are divided horizontally by watertight decks into three parts. The top section, open at both ends, is a tidal waterway; the centre section houses an air chamber, two scuttle tanks and four trim tanks; the lower section is a ballast chamber. Trunks and manholes give access to the various compartments.

The cambers into which the caissons slide can be sealed off for emptying and examination of the caissons, the centre camber being wider than the others to allow maintenance and repair work on any of the caissons to be carried out.



A hose-handling crane in action during discharge of oil.

Britain's Largest Oil Dock—continued

Caisson Operating Machinery.

Because these caissons have very great inertia, control of their movements must be precise and sensitive, particularly at the beginning and end of their traverse.

The problems involved were solved by employing, for the first time on this class of work, " VSG " variable delivery pumps and motors, integral with the hauling machinery. The " VSG " hydraulic drive allows smooth, infinitely variable speed variation from zero to full speed while regulating the speed of haulage automatically to suit the load.

Behind each camber, in a machinery house, a set of machinery drives two 4-ft. diameter winch drums rove with 6½-in. circumference steel wire ropes, which, over various sheaves, move the caisson into the open or closed position.

These sets of machinery consist basically of a 125 h.p. electric motor running at 490 r.p.m. driving a variable delivery pump (" VSG " A-end) supplying oil under pressure to a rotary hydraulic motor (" VSG " B-end) which turns the winch drums through various trains of gearing. Each drive is duplicated for emergency purposes. Normally, using both drives, a hauling spee of 40-ft. per minute is obtained, but with one drive only, through a change-speed gearbox, it is possible to operate at 20-ft. per min e.

The necessary delicacy of control for the caissons' m ovements is obtained by varying the inclination of a " tilting bo " in the " VSG " pumps. This regulates the amount of fluid dis harged to the " VSG " hydraulic motors and the direction in wh h it circulates, thereby controlling the speed and direction of r tation of the hauling machinery. This change of tilt is accompli ed by a small, 1 h.p. reversing pilot motor, which is controlled by n operator's hand lever. The direction of tilt applied controls the direction of motion of the caisson; the angle of tilt controls the spe d of the caisson's movement.

An auxiliary means of opening or closing the lock, in the event of a complete electrical breakdown, is provided by a normal 3-cylinder oscillating hydraulic engine. Also connected to this engine is a 10-ton capstan head which can be used either for emergency movement of the caissons across the entrance or for warping the caissons about the lock.

Cathodic Protection

Technical Development to Combat Corrosion

By H. F. CORNICK, M.C., M.I.C.E.

Corrosion, that is to say, the destruction of metals by chemical or electro-chemical agencies is one of the most costly items of maintenance with which all users of metals are faced.

This is particularly so in the case of iron and steel in the presence of moist ground or water, whether it manifests itself as " pitting " of steel, " graphitisation " of cast iron or appears under the name of " bacterial corrosion."

The subject has been dealt with in several articles in the " Dock and Harbour Authority " during the past year, in which the writers have reviewed the more important and recent research work that has been carried out both in respect of the various aspects of corrosion together with the protection of steelwork from corrosive action, by the use of corrosion resistant materials, protective coatings and cathodic methods.

Cathodic protection of iron and steel is a modern approach to the problem of arresting the corrosion of ferrous plant and equipment. It is particularly valuable in the case of buried or submerged structures where normal maintenance may be difficult or impossible and it can be utilised for certain other types of plant. While it has a simple scientific basis, like so many other modern technological developments, its proper and economic use requires specialised knowledge and experience.

For the benefit of students and others who may be unfamiliar with the subject the following is a brief explanation of the theory involved. With regard to the origin of cathodic protection, it is recorded that Sir Humphrey Davy (1778-1829) was the first scientist to employ an electric current to the problem of chemical decomposition and it was he who first made use of blocks of zinc for the protection of the copper sheathed hulls of the timber built vessels of his day. It is only within comparatively recent years that Davy's discovery has been followed up and developed.

Almost all processes of corrosion are " electro-chemical " in character in which the " anode " is the oxidised area and the " cathode " is the area of reduction in a metal part which, with the environment substance (the electrolyte), forms a closed circuit constituting an electric cell.

An example of this is the simple galvanic cell used in school laboratories. This consists of an anode rode made of zinc and a cathode rode of copper immersed in a dilute acid solution. When this primitive battery is connected in electrical circuit, current flows from the zinc plate through acid electrolyte to the copper. In the process, zinc metal is dissolved but the copper remains unaffected. In scientific language, at the point of reaction—the zinc anode, atoms of metal are converted into positively charged ions by the loss of electrons, the latter flow towards the copper cathode and particles of metal pass into solution at the anode end of the circuit. Thus corrosion takes place.

A similar process occurs to metal structures below ground or water level. The damp ground or water becomes the electrolyte and the surface of the metal due to various causes tends to assume anode and cathode properties. The surface of the metal in contact with the electrolyte assumes varying activities at different points and, therefore, varying tendencies to go into solution at these points. This is due to inherent difference in the metal structure or to variations in the surface treatment, or again as the result of differences in the composition or concentration of the electrolyte. At the more reactive of these points may be pictured atoms of metal being converted into positively charged ions by the loss of electrons. The electrons migrate through the metal to neighbouring regions and the particles of metal positively charged pass into solution at the reactive spots. These positive ions, or others produced by mutual interaction with the electrolyte, migrate through the ground or water and are discharged at those regions which have become negatively charged by the accumulation of electrons. Thus there is a complete cyclic movement and the movement of the electrons constitutes a flow of electric current, which, by convention is regarded as moving in a direction opposite to that of the electrons. The current, therefore, leaves the structure at the actively corroding spot, termed the anode, traverses the electrolyte for a greater or less distance and re-enters the structure in some neighbouring region termed the cathode.

Hydrogen is discharged at the cathode which becomes polarised, forming a resistance to the discharge of further hydrogen. Normally the hydrogen formed is removed by diffusion, either by the hydrogen itself passing outwards or by atmospheric oxygen diffusing in and oxidising it. In the complete absence of oxygen the process might be expected to come quickly to an end by being stifled at this stage. In anærobic or oxygen-free conditions, however, sulphate reducing bacteria play an important part and " bacterial corrosion " is very common on pipelines laid in heavy water-logged clay. It is accepted that the activities of these bacteria consists in reducing sulphates to sulphides by means of hydrogen which they obtain from the cathodic area of the metal. As a result polarisation is prevented, there is a flow of current and corrosion is allowed to proceed.

From what has been said it will be seen that if current can be prevented from leaving the structure at the anodes, no corrosion will take place. To accomplish this a voltage is applied to the structure so that a current flows through the ground or water into the structure at those places where the metal is exposed. The whole of the structure is thus rendered cathodic and so is incapable of corroding.

There are alternative ways of doing this, one by utilising galvanic anodes which provide their own source of energy and the other by passing a current from an external source into the structure. The method adopted for any particular scheme will depend on local circumstances and the potential at which the current is required to be applied.

Cathodic Protection—continued

Both methods mentioned have their particular spheres of usefulness depending on a number of factors. Protection by means of galvanic or reactive anodes operates on the principle of preventing corrosion at the lesser expense of replaceable anodes. These anodes, often of a special magnesium alloy, are connected to the structure to form a primary cell, the electrolyte consisting of the earth or water in which the structure is positioned. The arrangement is such that the current, which is self generated, leaves the metallic circuit via the anodes to the electrolyte, rendering the structure cathodic and thus incapable of corroding, whilst the anodes are gradually consumed in the process. Polarisation of the structure slowly takes place, restricting the current flow thereby and reducing the rate of anode consumption. Magnesium is chosen for such reactive anodes because it combines a high potential with freedom from polarisation and at the same time is economical in use. Special alloys are used, calculated to give maximum efficiency with long life.

In some applications and where the resistance of the electrolyte reaches high values, it becomes advantageous or necessary to apply a potential greater than can be provided by magnesium. The applied current method is then used and the anodes in this case are made of inert material such as graphite which is not consumed. The current required for the process is provided from mains supply by means of rectifiers. These are available for operation from either single or three-phase supply and for either indoor or outdoor installations. Automatic or manual control of output can be provided.

In the United States of America and in Great Britain both state and industrial research organisations have conducted, during the past years, laboratory experiments and full-scale field tests of the various methods of effecting cathodic protection.

The importance of this preventive measure as a modern industrial development in the fight against corrosion is now fully appreciated and the methods have been used by many different types of industries. The hundreds of installations in use to-day in Great Britain and other countries are witnesses of the soundness of the technique. It is now employed on oil, gas and water pipe lines, water storage tanks, ships' bottoms, cast iron ships' propellors, floating docks, steel piling, mooring buoys, lock gates, and cable sheathing—to name but some of its applications.

The principles involved, whilst scientific, are simple but the successful application of these to modern industrial needs can only result from accumulated experience and research. This is one of the main reasons that has prompted F. A. Hughes and Westinghouse—the British specialists in this new field, to pool their technical resources and to offer their combined technique to industry in the form of "Guardion" Service. This Service comprises a supply of "Guardion" and "Westalite" Cathodic Protection equipment, full consultative and design facilities, together with appropriate surveys and site investigation. It thus provides everything required for complete schemes of Cathodic Protection either by means of reactive anodes, which are independent of external power sources, or by applied current using energy from mains supply.

"Guardion" Cathodic Protection installations have been used in all the above mentioned applications throughout the world.

Manufacturers' Announcements

New Pallet Truck and Tractors

On the 21st January last, a new factory extension of Messrs. Lansing Bagnall Ltd. was officially opened at Basingstoke by General Sir Ouvry L. Roberts, Quartermaster General to the Forces. Following the opening ceremony a demonstration was given of a wide range of mechanical handling equipment manufactured by the firm. These included three entirely new products.

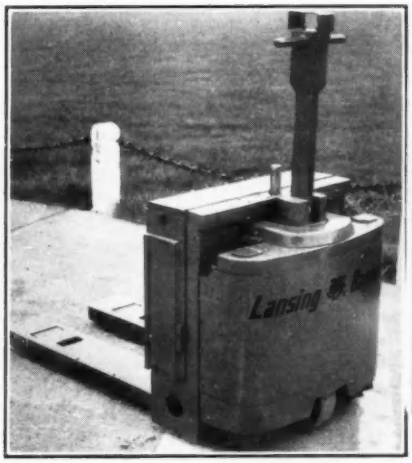
The first was a model of the new TD 200 Industrial Tractors embodying a 16 h.p. Enfield diesel engine of the twin-cylinder horizontally opposed type. Two versions are available so far: the fast Model TD 211 having a maximum speed of 20 m.p.h., intended primarily for airport and similar work where long distances have to be covered, and the slower but more powerful Model TD 200 for hauling heavy loads over shorter distances.

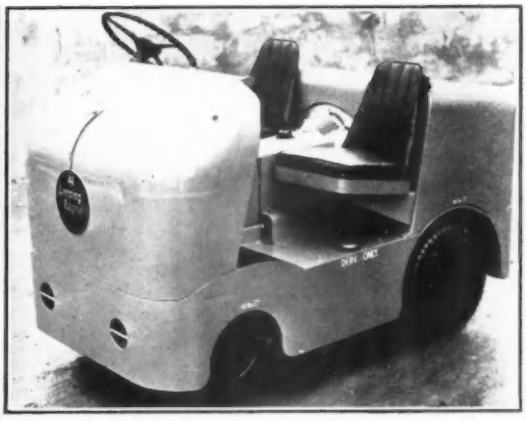
The engine is mounted above the rear axle. This gives added weight over the driving axle, without the necessity for having ballast weights which would result in an increase in the overall weight of the tractor.

The load capacity of the two models are 20 tons on level ground for the TD 220, and 12 tons for the TD 211. A remarkable feature of these tractors is their size. The overall dimensions are only 70-in. by 40-in. by 51-in. high, with a wheelbase of 40-in. The turning radius is only 58½-in.

The economy of diesel engines is well known, and it is interesting to note that in a recent test at a railway terminal 1 gallon of fuel oil was sufficient for a working time of about 10 hours. With a fuel tank capacity of 3 gallons this gives a possible running time of about 24 hours between refills.

The new 3,000 lb. Power Pallet Truck has been introduced to give a small yet high-capacity truck, which can be easily manœuvred in and out of standard covered railway wagons with palletised loads.





"Lansing Bagnall" Pallet Truck (left) and Tractor (above).

In this entirely new design the power unit, controls and battery occupy a depth of only 17½-in., so that with the standard fork length of 36-in. the overall length of the truck is only 53½-in. It is claimed that this makes it the shortest power pallet truck of similar capacity now available throughout the world.

Apart from its use for handling railway traffic, the compact dimensions of this new power pallet truck render it very suitable for working in and out of lifts, lorries and congested stores. The low service weight of 9 cwt. also enables the truck to work in many lifts and multi-storey buildings where the floor loading is restricted and precludes the use of heavier trucks.

This new Model PP 230 truck is made with fork lengths of 36, 40 and 48-in. Fork extensions enable all the usual pallet sizes to be handled.

The third new model was a tractor designed to meet the special requirements of airport operation. Based on the AP 4 range of diesel tractors which are primarily intended for industrial use, the performance and appearance of the new design had to be modified to conform with the needs for a fast and mobile vehicle. Apart from its main function as a tractor for luggage trailers, its high speed enables it to function as a fire fighting vehicle. In addition to a seat beside the driver, a folding seat and space for equipment are provided at the back.

Manufacturers' Announcements—continued

Portable Lighting Equipment

Designed to promote better working conditions and increased safety, a new range of portable lamps for industrial use has been produced by Oldham and Son, Ltd., of Denton, Manchester.

Included in the series is the Tanka II Portable Electric Lamp. This is a lamp which gives security whilst in use by means of a magnetic lock over the charging contacts and sealed locks on the lens ring and lamp top. It is recommended for use in oil refineries, gas works, chemical works, on oil tankers, etc.

A new three-colour signal lamp for operation above or below ground is the Oldham Shunters' Lamp, which is designed for all portable signalling including shunting control, etc., and for the marking of obstructions.

Also included in the new range are two sizes of the Tuba Electric Safety Torch. Special features incorporated include protective grill, armoured glass lens, semi-polished reflector, special shock protector between bulb and battery, a heavy gauge chromium plated brass body with lens-locking screw and spring loaded contact plunger.

The new standard G.W. Oldham Cap Lamp has been developed from the miners' cap lamp. They provide the maximum illumination along the line of vision leaving both hands free adding greatly to working efficiency in dark places.

These lamps are now available to industry generally, and can be used in many industries, such as mines, ship yards, power stations, timber yards, steel works, docks, warehouses, etc.

New Straddle Carrier

The British Straddle Carrier Company Limited, the only manufacturers of Straddle Carriers in the Sterling Area, follow the success of their " Timber Wolf " range of Straddle Carriers for the timber trade, by introducing the " Steelmaster " range. The new model has been specially designed and developed for the iron, steel and allied industries. The rapid and economical handling and fast transport of lengthy loads of steel sections, bar steel, billets and girders—and steel, iron and non-ferrous pipes, tubes, rods and wire have hitherto presented problems of considerable magnitude.

The advent of the " Steelmaster " which is available with eight different sizes of load aperture, and with lifting and carrying capacities up to 22,000 lbs., is claimed to provide a solution to this problem, as the need for frequent transfer of load from one type of mechanical handling device to another is eliminated.

The new model has successfully passed the most exacting tests, and is capable of carrying a load ranging in width from 43-in. to 58-in., and from 54-in. to 60-in. in height. It has a single gear lever control for all forward and reverse gears. All lifting operations are also controlled by a single lever.

Steering is light and positive and there is clear vision when driving onto loads. Inside turning radius is 9-ft. only, and operating speeds of up to 25 m.p.h. in either forward or reverse, provide a high degree of manoeuvrability in all working conditions.

Navigation Aid for Ships of British Railways

Following successful experience in 27 of their ships over a period of years, and with the completion of the chains of land-based transmitting stations around Great Britain, British Railways have recently decided to extend the use of the electronic position-fixing device, the Decca Navigator, by fitting it in the remaining 40 cross-channel vessels of their fleet. This apparatus provides the navigating officer with a simple, reliable method of fixing the position of his ship under all conditions, including fog and when other methods of navigation are restricted or unable to operate.

The Decca Navigator enables the ship's position to be continuously known to an accuracy of a few yards by plotting on a gridded chart the readings of meters which operate automatically from the land transmissions.

The railway-owned vessels have been associated with the Decca System since it was first introduced to the shipping world. Two railway vessels—the " Accrington " and the " Dewsbury "—took part in the original Ministry of Transport trials in 1946. After the system was officially approved as a navigational aid early in 1947, railway vessels were rapidly fitted in those areas where good coverage was initially provided. As more chains of transmitting stations were laid down, so the number of ships fitted increased, for the system has proved itself to be reliable and accurate.

New Mobile Crane

Walker Bros., Ltd., of Wigan, have recently introduced a new model, the " Walker " 6/8 ton mobile diesel electric crane. The manufacturers claim that this model has several features never before available in mobile cranes. It is a diesel electric, pneumatic tyred rigid 6-wheel vehicle, with good manoeuvrability in confined spaces.

The crane is electrically operated, and all controls are arranged inside the driver's cab, from which the operator has a full view of the crane which is capable of slewing through 360° in one-third of a minute.

No outriggers are necessary to lift the 6 ton load at a maximum radius of 10-ft., whilst with quickly retractable outriggers the range is up to 8-ton loads. The vehicle is mobile over a wide range of distance and speed. It is powered by a 4LW Gardner Diesel Oil Engine coupled direct to a Generator, which supplies the power to excite a traction motor of continuous rating, with sufficient torque to drive the double worm driven rear bogie.

Large diameter, wide brake shoes operate on all six wheels, these wheels being permitted sufficient articulation in all directions to enable moderate sized obstacles to be negotiated. The tyre ground pressures are exceptionally low, allowing operation on soft ground.

This type of vehicle possesses the advantage of the elimination of transmission gears, clutches and controls with consequent faster handling and ability to manoeuvre. Craning, slewing and derricking speeds are ample for all normal loads which range from three tons at 16-ft. to six tons at 10-ft., when using the standard jib, without employing outriggers. A variety of other jibs are available.

Tugs for Dock and River Work

Production of small tugs of a new design but equipped with many of the features of larger vessels has been started in Pittsburgh, U.S.A., by the Dravo Corporation. The first of the new vessels is expected to be launched later this year.

The builders state that these 70-ft. motor vessels have been specially designed for towing coal, sand and gravel barges, and for shuttling cargo barges. They also will be useful for the handling of minor duties, too small for regular, larger tugs, such as delivering barges carrying coal, steel and petrol to various docks and terminals. Their use is expected to reduce congestion in river traffic, and so help to make it more efficient.

Features of the new small-sized tugs will include deck-house control of the main engines, reverse-reduction gears, permitting the reversing of the boat without the reversal of the engines, and internal passageways leading to all quarters. They will be fitted with two motor engines, and will have twin propellers to add pushing power and manoeuvrability.

WANTED.

WANTED: A copy of "The Dock and Harbour Authority":—
MARCH, 1943.

Offers to The Agent-General for South Australia, South Australia House, Marble Arch, LONDON, W.1. or The Secretary, South Australian Harbors Board, Box 679E, G.P.O., ADELAIDE, STH. AUST.

SITUATION VACANT.

ENGINEERING ASSISTANT required for work at Southampton Docks at a starting salary of £615 per annum.

Applicants should have passed or gained exemption from Final Parts I and II of the examination for Associate Membership of the Institution of Civil Engineers and have had some experience in the design of dockside structures and buildings in steel and/or plain and reinforced concrete.

Applications stating age, qualifications, etc., should be addressed to the Docks Engineer, British Transport Commission, Docks & Inland Waterways, Herbert Walker Avenue, New Docks, Southampton.